AERO ENGINEERING — CHARTS

LIST OF DATA SHEETS

No.	*Subject*
1.	Short Singapore Mark III Seaplane.
2.	Short Scion Senior.
3.	Short Scion Monoplane.
4.	Hawker Hart.
5.	Bristol Type 130 Bomber Transport.
6.	Armstrong Whitworth " Whitley " Monoplane.
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10.	Vickers Supermarine Stranraer Flying Boat.
11.	Hornet Moth (D.H. 87B).
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LIST OF DATA SHEETS

No.	*Subject*
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52.	Hawker Hurricane.
53.	De Havilland Flamingo.
54.	De Havilland Moth Minor.
55.	Bristol Beaufort.
56.	General Aircraft Cygnet.

"SHORT" "SINGAPORE" MARK III BOAT SEAPLANE

DESCRIPTION

TYPE

Four-engined, high-performance, long-range reconnaissance and coastal patrol flying-boat made by Short Bros. (Rochester and Bedford) Ltd.

WINGS

Unequal span biplane. Top and bottom centre sections extending to the engine struts. Lower centre section spars built up in triangulated form of round steel tubes. Wing construction of usual "Short" type. Ailerons on top and bottom wings.

HULL

Two-step type. Underwater planing surface specially designed to eliminate any tendency to porpoise. Heavy spar frames are built into the hull in line with the wings and tail unit. Wing tip floats of similar construction to the hull.

TAIL UNIT

Monoplane adjustable tail plane mounted on the rear end of the hull. Triple fins and rudder. Tracking centre fin operable from cockpit.

POWER PLANT

Four Rolls-Royce "Kestrel" 12-cylinder vee water-cooled engines, mounted in tandem pairs.

The front engines are "Kestrel III." M.S. (gear ratio ·477–1) and the rear engines "Kestrel II." M.S. (gear ratio ·553–1).

The rated power of each engine is approximately 560 B.H.P. at 2,350 r.p.m. at 2,000 ft. Each pair of engines is mounted in a monocoque duralumin nacelle supported by single front and rear interplane struts.

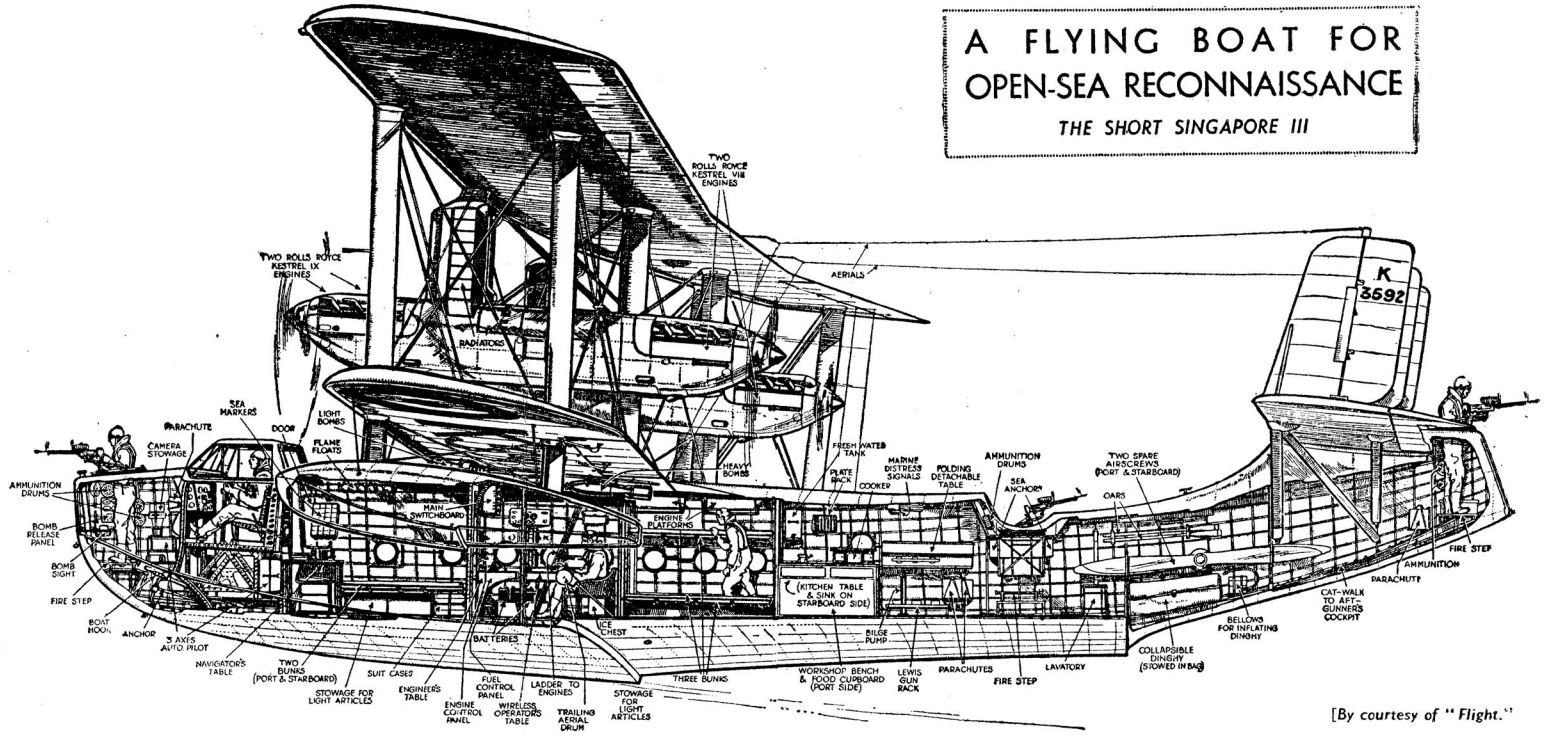
The petrol for normal range is accommodated in the upper centre section with gravity feed to the engines. The overload petrol is carried in stainless steel tanks in the lower centre section, whence it is pumped by means of the engine pumps to the main tanks in the upper centre section.

The oil tanks, each of 9 gallons capacity, are situated in the nacelles.

An auxiliary power unit is fitted in one nacelle for refuelling, bilging, charging of H.T. accumulator of W/T. and charging air bottles for the engine starter. Engine slinging gear is provided to enable engines to be changed while the machine is afloat.

A FLYING BOAT FOR OPEN-SEA RECONNAISSANCE

THE SHORT SINGAPORE III



[By courtesy of "Flight."

ACCOMMODATION

Bomber's position in nose of cockpit. Enclosed pilot's compartment with side-by-side seating and complete dual control.

A central gangway between the seats gives access to the front compartment, used as the officers' quarters and is fitted with two bunks.

The navigator's chart table is situated in this compartment.

The space between the spar frames is occupied by the engineer and the W/T. operator.

Behind the rear spar frame is located the crew's quarters, which is fitted up with three bunks. Provision is arranged for cooking apparatus, work bench with vice, stowage for drogues, dinghy, engineers' ladders, etc.

The midship gun is arranged on a sliding mounting, so that vertical fire can be obtained on both sides of the aeroplane. At the extreme aft end of the hull, behind the tail, is a further gunner's cockpit.

DIMENSIONS, WEIGHTS & PERFORMANCE

DIMENSIONS

Span : Upper plane	90 ft. 0 in.
Lower plane	76 ft. 0 in.
Length overall	64 ft. 2 in.
Height (off trolley)	23 ft. 7 in.
Wing area	1,834 sq. ft.

WEIGHTS

Weight, empty	18,420 lbs.
Fuel and oil	6,275 lbs.
Military load	2,805 lbs.
Weight, loaded	27,500 lbs.

WEIGHTS—*continued.*

Maximum take-off weight	31,500 lbs.

PERFORMANCE

AT WEIGHT OF 27,500 lbs.

Maximum speed at 2,000 ft. (610 m.)	145 m.p.h.
Minimum speed	65 m.p.h.
Initial rate of climb	700 ft./min.
Ceiling	15,000 ft.
Time to take off in flat calm	22 secs.
Range in still air at cruising speed of 105 m.p.h. (168 km./hr.)	1,000 miles.

THE "SHORT" "SCION SENIOR"

DESCRIPTION

TYPE

This aircraft is a high-wing full cantilever monoplane with the four engines carried forward of the leading edge of the wing, and except for certain items of secondary structure, is entirely of metal.

FUEL SUPPLY

The fuel is carried in light alloy tanks fitted in the wing and each engine is fed by its own pump and suction pipe direct from the tank. In case of pump failure on one engine, the engine concerned is automatically fed by the pump of another, each pump being capable of supplying more than sufficient fuel for two engines.

ACCOMMODATION

The pilot is situated in the extreme nose in an enclosed cockpit with sliding roof and opening side windows. The pilot's view is extremely good.

The cabin has ample space for a maximum of nine passengers and has controllable heating and fresh air systems. A lavatory is also embodied.

The aircraft is of very sturdy construction, the fuselage frame being of welded high tensile steel tube, suitably faired and fabric-covered externally.

CONSTRUCTION

The main wing spar is a built-up box girder in duralumin of a type which has proved exceedingly satisfactory, the wings being torsionally very stiff with a complete absence of vibration or tendency to "flutter."

The planes are detachable at the side of the fuselage.

The ribs, ailerons, tail unit, etc., follow on the lines of "Short" standard practice and are entirely of duralumin.

The undercarriage fittings are designed to take either a land chassis or a twin-float chassis of "Short" standard design.

The land chassis has intermediate pressure wheels, compressed air-cum-oil shock absorbers, and compressed-air differentially operated brakes.

ELECTRICAL EQUIPMENT

A very complete electrical installation is included in the standard specification. This consists of generator, battery, navigation instrument, cabin lighting, landing headlight and direct cranking electric engine starters.

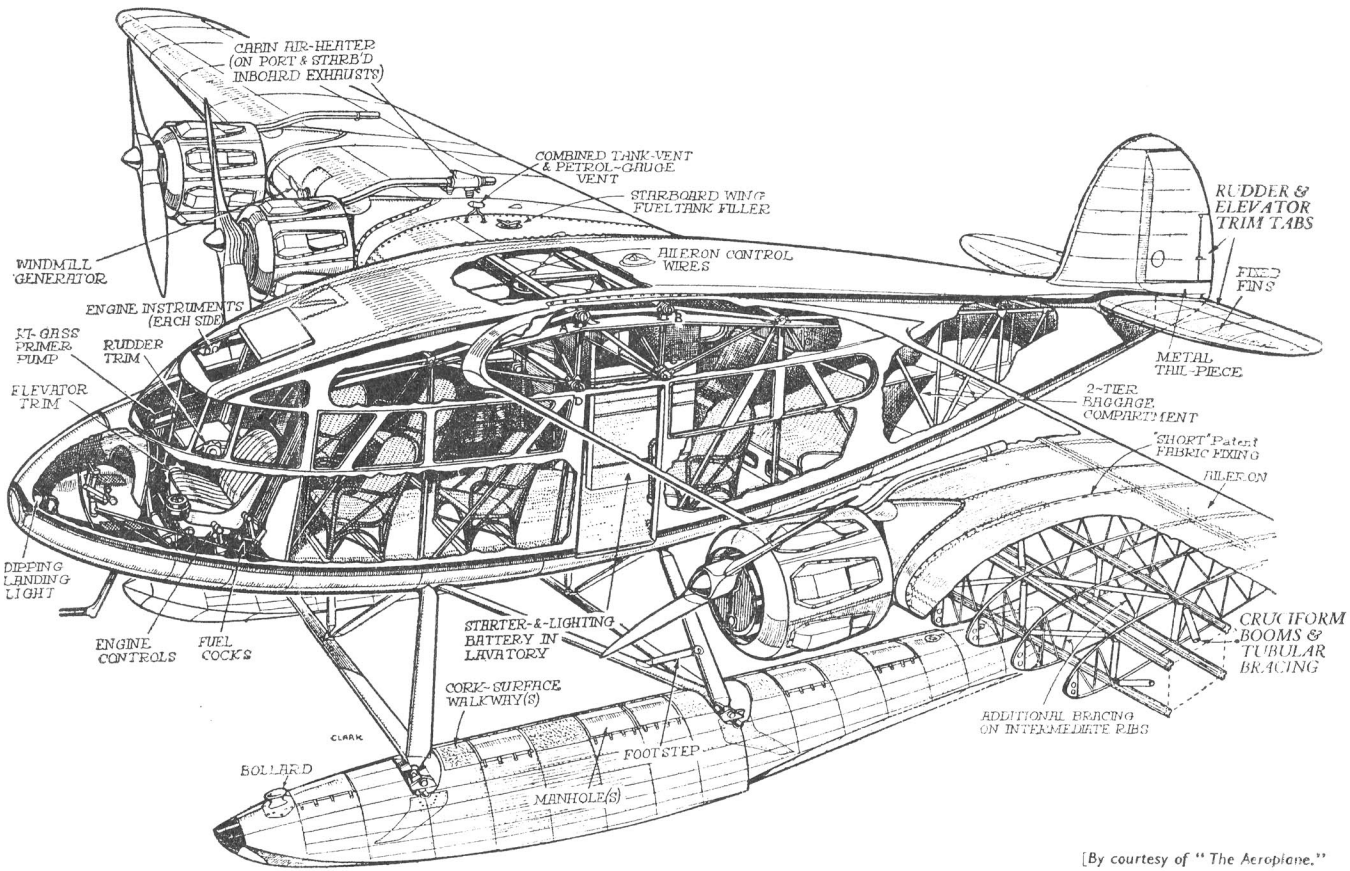
Radio can be fitted if required, but is not included in the weights given hereafter.

The leading particulars are as follows :—

POWER UNIT

Four Pobjoy "Niagara" III engines.

Maximum power per engine : 95 B.H.P. at 3,650 R.P.M.
Normal ,, ,, ,, 88 ,, ,, 3,300 ,,



[By courtesy of "The Aeroplane."

DIMENSIONS, WEIGHTS & PERFORMANCE

DIMENSIONS

Span of main plane	55 ft. 0 in.
Overall length—thrust line horizontal	42 ft. 0 in.
Overall height—landplane tail on ground	9 ft. 10 in.
Overall height—seaplane on trolley	12 ft. 9 in.
Wheel track	11 ft. 9 in.
Main plane area	400
Cabin dimensions :	17 ft. 0 in. long by 4 ft. 6 in. wide by 5 ft. 0 in. mean height. 382 cu. ft.

WEIGHTS

LANDPLANE

Tare weight, fully equipped but less radio	3,652 lbs.
Fuel—60 gallons	462 lbs.
Oil—8·5 ,,	77 lbs.
Weight of machine ready for flight	4,191 lbs.
Maximum permissible weight	5,750 lbs.
Pilot, passengers and baggage	1,559 lbs.

PERFORMANCE

LANDPLANE

Maximum speed	143 m.p.h.
Cruising speed at 3,200 r.p.m.	122 ,,
Landing speed	55 ,,
Rate of climb (sea level)	600 f.p.m.
Ceiling (service)	13,000 ft.
Rate of climb on 3 engines	300 f.p.m.
Ceiling on 3 engines (service)	5 500 ft.
Rate of climb on 2 engines	Just positive.
Ceiling on 2 engines	
Range on standard tanks at 3,200 r.p.m.	400 miles.
Fuel consumption at 3,200 r.p.m.	18 g.p.h.
Air miles per gallon at 3,200 r.p.m.	6·68

"SHORT" "SCION" MONOPLANE

DESCRIPTION

TYPE

Twin-motor light transport aeroplane made by Short Bros. (Rochester and Bedford) Ltd.

WINGS

High wing cantilever monoplane tapering in cord and thickness. Modified Gottingen 436 section. Incidence 5 deg. Each wing attached to top of fuselage. Single box-girder spar with booms of extruded Duralumin sections. Tubular Duralumin cross and bracing struts. Typical short ribs with tubular Duralumin booms and struts. Leading edge covered with light alloy sheeting right round from under to top side of spar. Fabric cover over all. Frise ailerons. Flanged Duralumin diaphragms each clipped to tubular Duralumin spar. Whole covered with fabric.

FUSELAGE

Rectangular tubular structure with welded side-frames of steel to specification T.45, linked with tubular Duralumin cross-struts and wire bracing. Fabric covering over wooden stringers.

TAIL UNIT

Braced tailplane adjustable in air by screw-jack beneath rear spar. Cantilever fin. Balanced elevators and rudder. Entire structure of Duralumin covered with fabric.

UNDERCARRIAGE

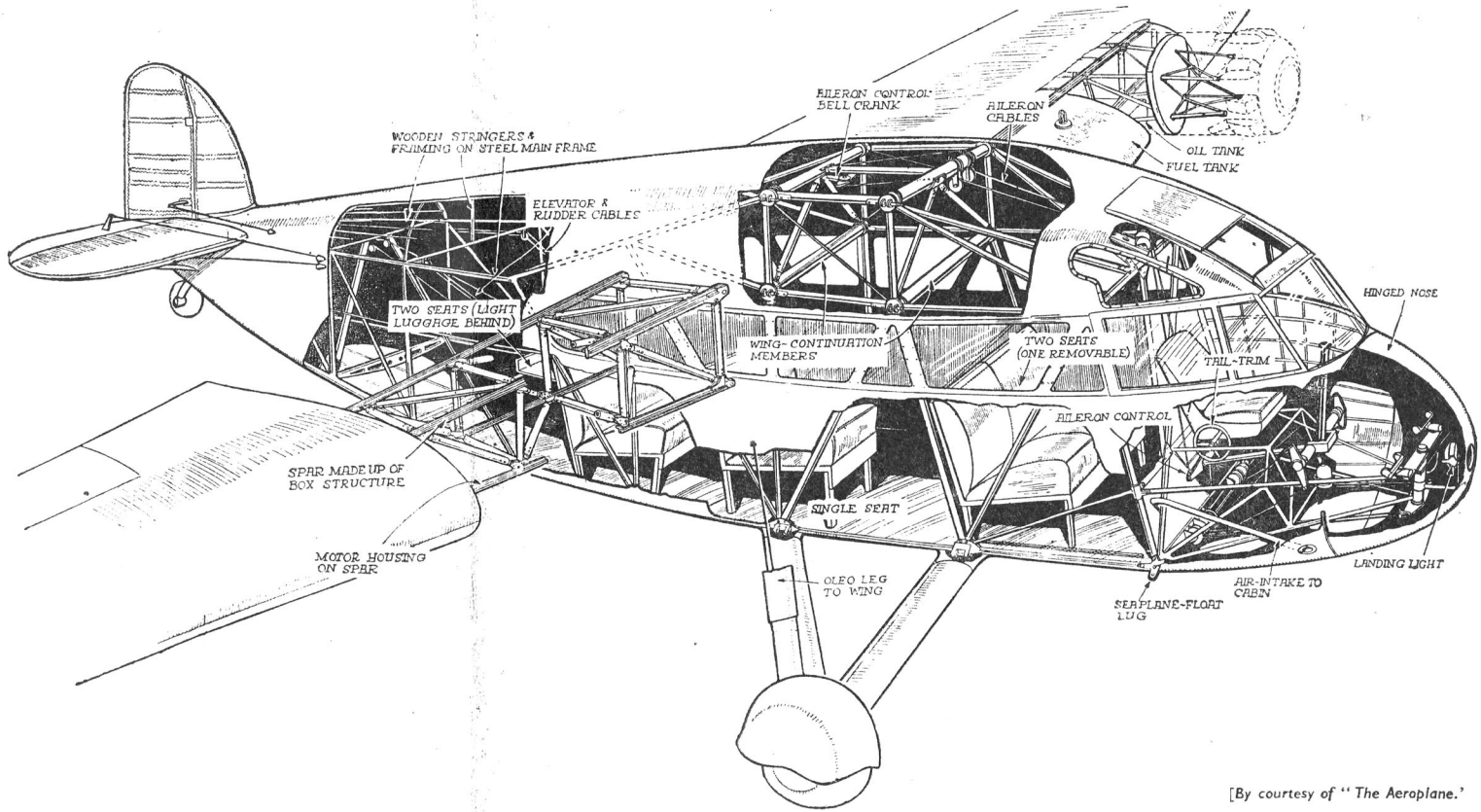
Divided. Dowty shock-absorbers. Dunlop pneumatic brake and wheels. Tail-wheel.

POWER PLANT

Two 90 h.p. Pobjoy Niagaras mounted in line with leading edge. Riveted Duralumin tanks in wings with total capacity of 31 gallons. Electric starters.

ACCOMMODATION

Single seat for pilot in nose with bulkhead and door between him and cabin. Latter measures 10 ft. long by 3 ft. 3 in. wide by 5 ft. high. Volume 163 cubic ft. Door in port side. Seats for five passengers. Place for luggage at back of cabin and beneath seats.



[By courtesy of "The Aeroplane."

DIMENSIONS, WEIGHTS AND PERFORMANCE

DIMENSIONS

Span		42 ft. 0 in.
Length		31 ft. 6 in.
Height (tail down)		8 ft. 0 in.
Max. chord		8 ft. 9 in.
Chord at wing-tip		5 ft. 0 in.
Area : Wings (incl. ailerons)		255·3 sq. ft.
	Ailerons	28·3 sq. ft.
	Tailplane	20·26 sq. ft.
	Elevators	16·5 sq. ft.
	Fin	7·35 sq. ft.
	Rudder	9·56 sq. ft.

WEIGHTS

Tare weight (in flying trim, but less night-flying equipment)	1,770 lbs.
Weight of full night-flying equipment, including generator, battery, cabin and instrument lights, navigation lights and landing headlight	55 lbs.
Fuel (31 gallons)	239 lbs.
Oil (9·7 gallons)	29 lbs.
Pay-load and pilot	1,162 lbs.
Disposable load	1,430 lbs.
Weight, loaded	3,200 lbs.

PERFORMANCE

Maximum speed 1,000 ft. : 128 m.p.h.

Cruising speeds at 1,000 ft. : 116 m.p.h. at 3,200 r.p.m., 112 m.p.h. at 3,100 r.p.m.

Landing speed 50 m.p.h. Rate of climb (sea level) 625 ft. per min.

Absolute ceiling, 13,000 ft.

Time of take-off (5 m.p.h. wind), 15 secs.

Length of take-off run (5 m.p.h. wind), 140 yds.

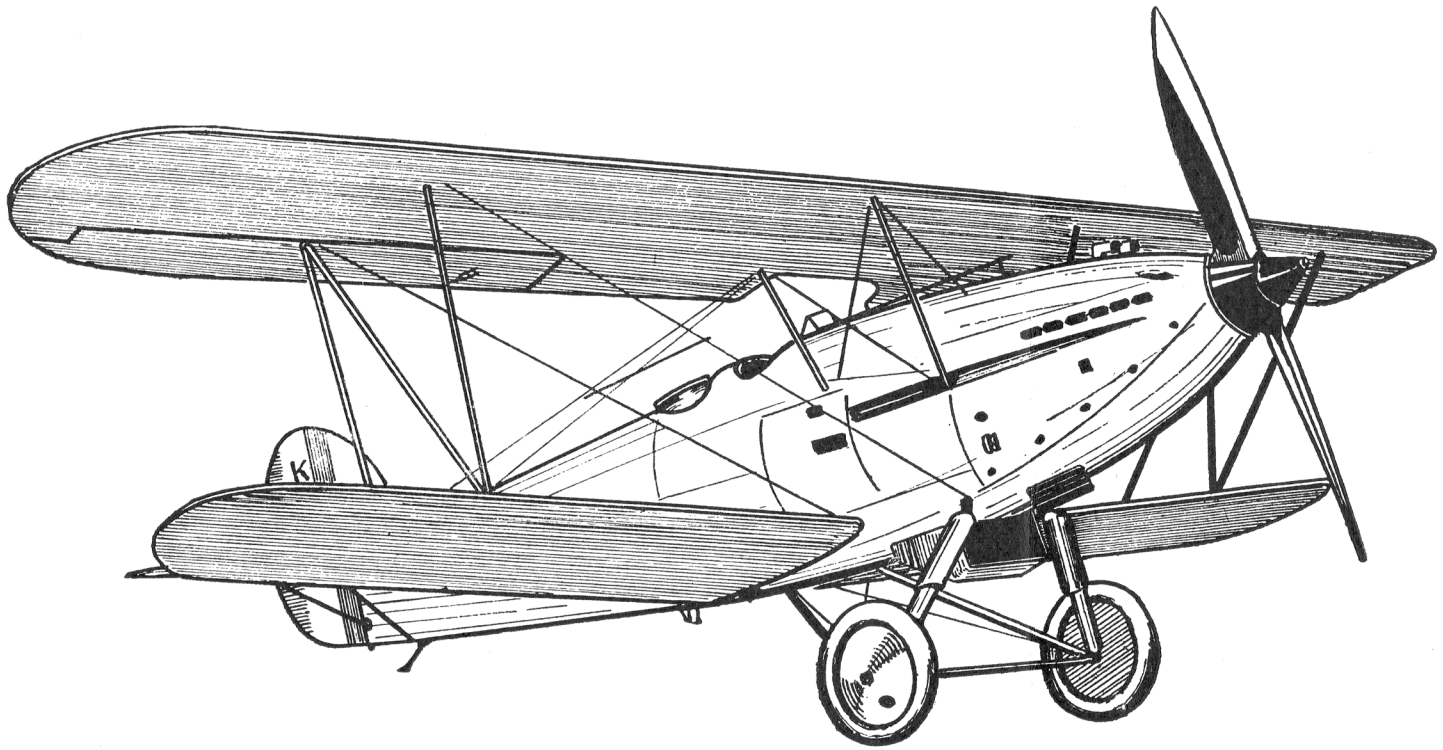
Length of landing-run with brakes, 140 yds.

Fuel consumption (cruising at 3,100 r.p.m.) 9 gallons per hour.

Range (cruising at 3,100 r.p.m.), 390 miles.

The top speed as a seaplane is 117 m.p.h.

THE HAWKER HART



ENGINE	Kestrel IB or X (de-rated)	MAXIMUM SPEED	184 m.p.h.
WEIGHT LOADED	4,620 lbs.	CREW	Two (1 pilot, 1 gunner)

MAIN DIMENSIONS AND PARTICULARS

Span top plane	37 ft. 3 in.	Chord bottom plane	5 ft. 0 in.
Span bottom plane	31 ft. 4 in.	Dihedral top plane	1°
Overall length	29 ft. 4 in.	Dihedral bottom plane	4°
Overall height	10 ft. 5 in.	Sweepback (top plane only)	5°
Chord top plane	6 ft. 0½ in.	Wheel track	6 ft. 4 in.

BRIEF DESCRIPTION

The Hart (designed and constructed by Hawker Aircraft Ltd., Kingston-upon-Thames) is a two-seater biplane high-performance day bomber fitted with a Kestrel IB or Kestrel X (de-rated) engine. On the port side of the pilot's cockpit is mounted a Vickers fixed ·303 in. gun, operated by synchronising gear, and a Lewis gun is mounted at the rear cockpit. As well as being able to use the Lewis gun, the observer can also take up a prone bombing position underneath the pilot's seat.

FUEL CAPACITY

Main tank	65 gallons
Gravity tank	19 gallons

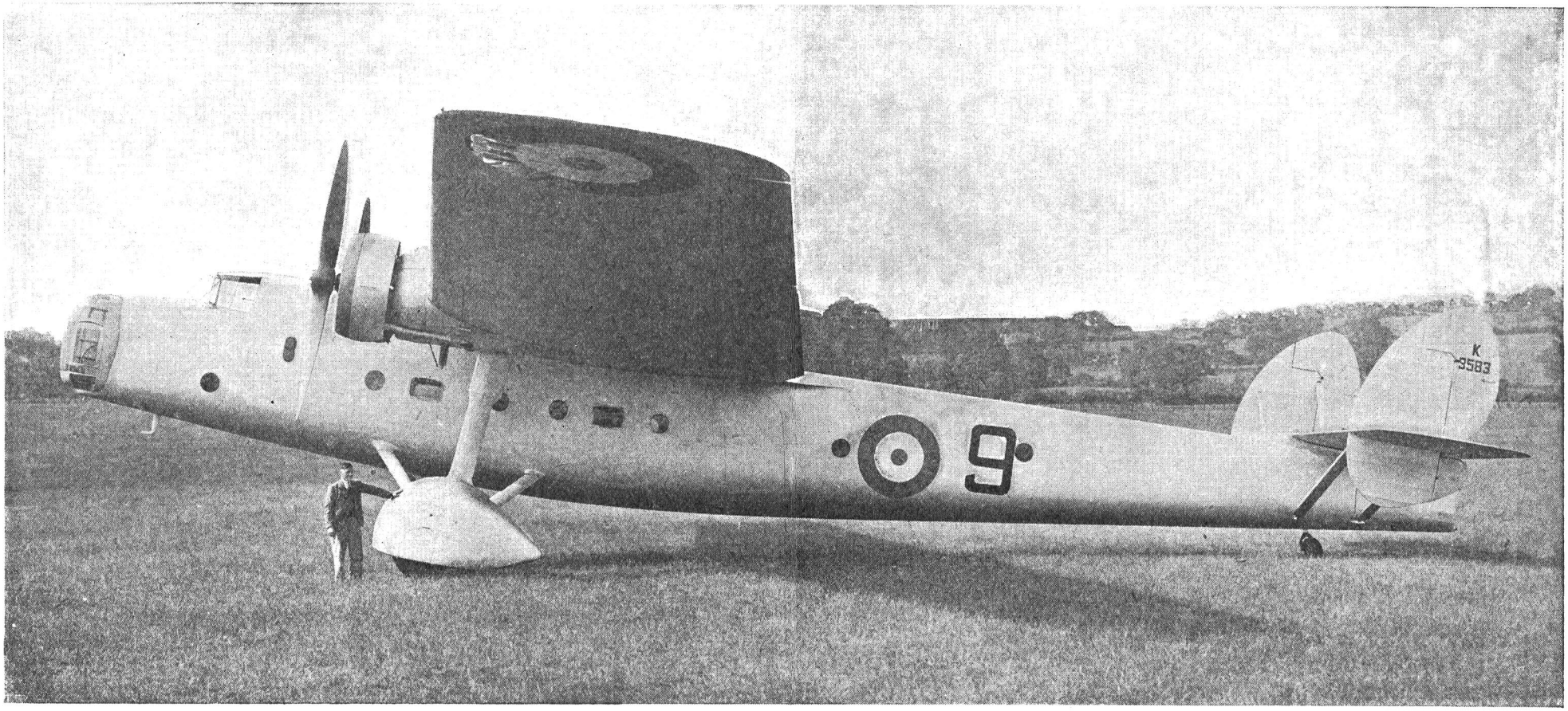
OIL CAPACITY

Oil tank	7 gallons oil, 1 gallon air space

COOLING WATER CAPACITY

Normal	12 gallons, 1 gallon air space

BRISTOL TYPE 130 "BOMBAY" BOMBER TRANSPORT



GENERAL CATEGORY AND TYPE

A twin-engined high performance bomber-transport aeroplane.

ENGINES

Two "Bristol" Pegasus X engines. 9 cylinder radial air-cooled.

ACCOMMODATION

4 as a bomber; and 3 crew + 24 fully armed troops as a troop carrier.

AILERONS

The wings are fitted with hydraulically-operated trailing-edge flaps.

WINGS

High wing monoplane. Metal covering.

OVERALL DIMENSIONS

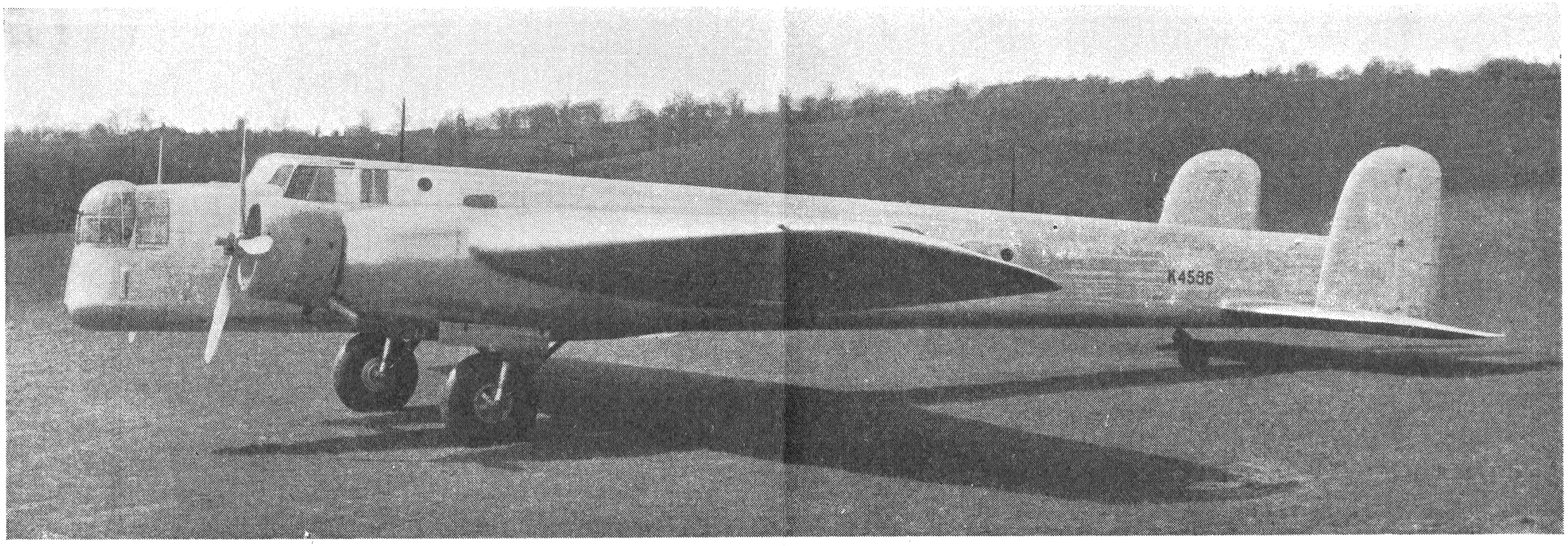
Length	67 ft. 9 in.
Span	96 ft.
Height	16 ft.

Weight, loaded, 18,000 lbs.

FUSELAGE

Monocoque construction. The body, wings and tail unit are all of metal construction throughout, with metal covering.

ARMSTRONG WHITWORTH "WHITLEY" MONOPLANE



DESCRIPTION

TYPE
Twin-engined, high-speed, long-range heavy bomber, made by Sir W. G. Armstrong Whitworth Aircraft Ltd., Coventry.

WINGS
Middle-wing cantilever monoplane, tapered in chord and thickness. The Armstrong Whitworth patented box-spar of corrugated light-alloy sheet is the form of construction employed. Hydraulically-operated landing flaps extend over part of the span.

FUSELAGE
Oval monocoque structure of light alloy, built in three sections.

TAIL UNIT
The cantilever tail plane embodies the same form of spar construction as in the main planes, and is adjustable on the ground, fore and aft trim being effected by elevator tabs.

UNDERCARRIAGE
Two interchangeable hydraulically-operated retractable units mounted beneath engine nacelles. Wheels retract immediately behind engines. Oleo shock absorbers work in conjunction with steel springs. Fully castoring tail wheel.

POWER PLANT
Two 795 h.p. Supercharged Armstrong Siddeley Tiger IX engines, attached to the main plane spar by Armstrong Siddeley patented flexible engine mountings. Three-bladed Hamilton controllable pitch air-screws are fitted.

ACCOMMODATION
Provision is made for a crew of five, consisting of two pilots, two air gunners, and one W/T. operator. The front and rear gunners' cockpits are provided with the Armstrong Whitworth balanced gun turret, in which the gunner is completely protected from the airstream by a transparent cupola. The manner in which the weight of the machine-gun is balanced by the weight of the gunner, together with the air-balancing of the gun-barrel, makes this gun-turret practically effortless in operation.

DIMENSIONS, WEIGHTS AND PERFORMANCE

Span	84 ft. 0 in.
Length	69 ft. 2·8 in.
Height	12 ft. 9 in.

WEIGHTS & PERFORMANCE

No data available.

THE GLOSTER GLADIATOR

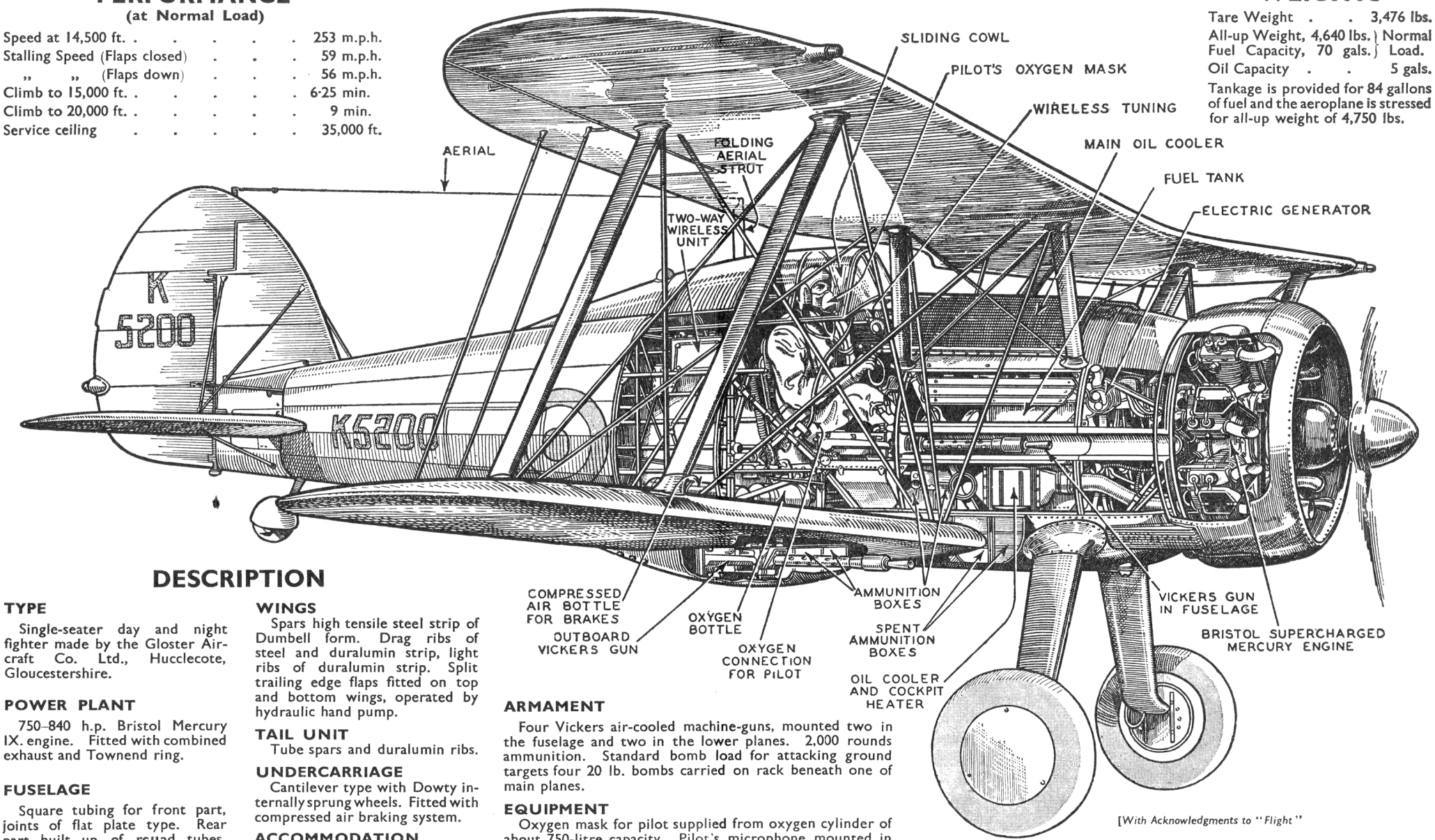
PERFORMANCE
(at Normal Load)

Speed at 14,500 ft.	253 m.p.h.
Stalling Speed (Flaps closed)	59 m.p.h.
„ „ (Flaps down)	56 m.p.h.
Climb to 15,000 ft.	6·25 min.
Climb to 20,000 ft.	9 min.
Service ceiling	35,000 ft.

WEIGHTS

Tare Weight	3,476 lbs.
All-up Weight, 4,640 lbs. } Normal Fuel Capacity, 70 gals. } Load.	
Oil Capacity	5 gals.

Tankage is provided for 84 gallons of fuel and the aeroplane is stressed for all-up weight of 4,750 lbs.



DESCRIPTION

TYPE
Single-seater day and night fighter made by the Gloster Aircraft Co. Ltd., Hucclecote, Gloucestershire.

POWER PLANT
750–840 h.p. Bristol Mercury IX. engine. Fitted with combined exhaust and Townend ring.

FUSELAGE
Square tubing for front part, joints of flat plate type. Rear part built up of round tubes, warren girder side bracing and wire braced plan structure.

WINGS
Spars high tensile steel strip of Dumbell form. Drag ribs of steel and duralumin strip, light ribs of duralumin strip. Split trailing edge flaps fitted on top and bottom wings, operated by hydraulic hand pump.

TAIL UNIT
Tube spars and duralumin ribs.

UNDERCARRIAGE
Cantilever type with Dowty internally sprung wheels. Fitted with compressed air braking system.

ACCOMMODATION
Single-seater. Enclosed and heated cockpit for the pilot.

ARMAMENT
Four Vickers air-cooled machine-guns, mounted two in the fuselage and two in the lower planes. 2,000 rounds ammunition. Standard bomb load for attacking ground targets four 20 lb. bombs carried on rack beneath one of main planes.

EQUIPMENT
Oxygen mask for pilot supplied from oxygen cylinder of about 750-litre capacity. Pilot's microphone mounted in mask. Two-way wireless unit with folding aerial strut. Night flying gear. Navigation lights.

[*With Acknowledgments to "Flight"*]

MILES WHITNEY STRAIGHT

BRIEF DESCRIPTION

TYPE

The Miles Whitney Straight is a low-winged cabin monoplane of wooden construction with side-by-side seating for two. Makers : Phillips & Powis Aircraft Ltd. It has been designed specifically for the owner-pilot, for instructional flying and for general club use, but it is readily adaptable as a light mail or goods carrier, as a special charter aeroplane or for military purposes.

DUAL CONTROL

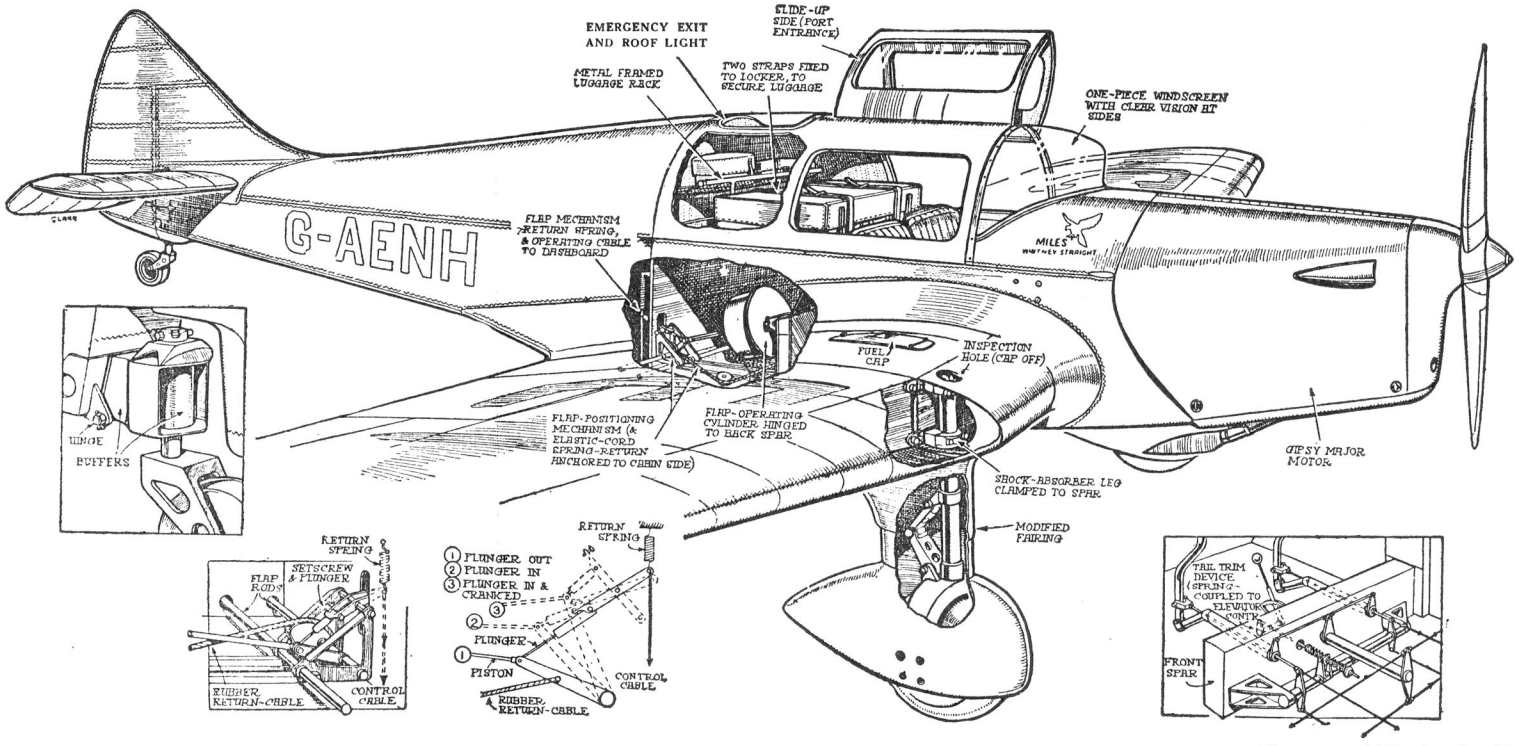
The aeroplane is equipped with full dual control. There are two independent vertical control columns, two throttles, and twin parallel motion adjustable length rudder bars.

ENGINE

De Havilland Gipsy Major 130 h.p.

OIL PRESSURE

40–45 lbs. per sq. in.



[By courtesy of "The Aeroplane"]

PERFORMANCE

Maximum speed at sea level	145 m.p.h.	Oil consumption	1·75 pints per hour
Cruising speed at 1,000 ft.	130 m.p.h.	Duration	4·4 hours
Rate of climb at sea level	850 ft./min.	Ultimate range	570 miles
Stalling speed with flaps	38 m.p.h.	Length of take-off	145 yds.
Fuel consumption : cruising	6·8 gal./hr.	Landing run (5 m.p.h. wind)	100 yds.

DIMENSIONS AND WEIGHTS

DIMENSIONS

Height	6·6 ft.
Length	25 ft.
Span	25·8 ft.
Span (wings folded)	17·2 ft.

WEIGHT UNLADEN

1,250 lbs.

MAXIMUM LOADING

2,000 lbs.

Fuel	231 lbs.
Oil	19 lbs.
Crew	170 lbs.
Payload	330 lbs.

THE HESTON "PHŒNIX"

DESCRIPTION

TYPE

Single-engined five-seater cabin monoplane for civil transport, charter work, and the private owner. Makers : Heston Aircraft Co. Ltd.

WINGS

High monoplane wing with washed-out elliptical wing tips. Comprises port and starboard panels attached direct to top of fuselage, externally braced by " N " struts on each side running to a cantilever lower stub wing carried across bottom of fuselage.

FUSELAGE

Complete unit built in two sections, constructed of four main longitudinals and birch-ply stressed skin covered with light fabric. Front section rectangular cross-section, built up on a braced wooden framework. Rear section is an elliptical monocoque with transverse frames and longitudinals. Metal cone at rear end of monocoque forms a fixed tail fairing for control cables and levers.

TAIL UNIT

Full cantilever tail of tapered plan-form. Wooden construction with two I-section spars, spruce ribs, ply leading-edge and fabric covering. Elevators are fabric covered with single trimming tab at trailing-edge of port elevator. Fin built integral with fuselage and ply covered. Rudder is fabric covered with ply leading-edge around nose back to spar.

UNDERCARRIAGE

Dowty fully retractable hydraulic type with retraction into wells in stub wing. Complete retraction in 14 seconds ; extension, locked for landing, in 8 seconds. Dunlop hydraulic brakes. Dowty fully castoring and self-centering tail wheel unit.

POWER PLANT

One 200 h.p. de Havilland " Gipsy-Six " six-cylinder inverted air-cooled engine.

ACCOMMODATION

Cabin 140 cu. ft., exclusive of luggage capacity. Accommodation for five, seated in two pairs, front and rear, with fifth seat in the centre.

DIMENSIONS, WEIGHTS & PERFORMANCE

DIMENSIONS

Span	40 ft. 4 in.
Length	30 ft. 2 in.
Height	8 ft. 7 in.
Wheel track	8 ft. 11 in.
Main plane incidence	3°
Dihedral	2°
Wing area :	
Main planes	246 sq. ft.
Stub plane	24 sq. ft.
Total	270 sq. ft.
Control areas :	
Ailerons	33·4 sq. ft.
Tail plane	23·2 sq. ft.
Elevators	14·5 sq. ft.
Elevator tab	0·8 sq. ft.
Fin	8·2 sq. ft.
Rudder	8·0 sq. ft.

WEIGHTS

Weight unladen	2,100 lbs.
Fuel (40 gal.) and Oil (4½ gal.)	350 lbs.
Pilot and four passengers	800 lbs.
Baggage	50 lbs.
Gross weight	3,300 lbs.
Maximum power	200 h.p. at 2,350 r.p.m.
Wing loading	12·2 lbs. sq. ft.
Power loading	16·5 lbs. h.p.

PERFORMANCE

Maximum speed	148 m.p.h.
Cruising speed, 125 m.p.h. at 2,050 r.p.m., and 10 gal. per hour fuel consumption.	
Landing speed	55 m.p.h.
Take-off at full load	250 yds.
Initial rate of climb	700 ft. per min.
Service ceiling	15,500 ft.
Cruising duration	4 hours at 125 m.p.h.
Cruising range at full pay load	500 miles
Tankage provided for 6 hours and cruising range of 750 miles with alternative loading.	
Oil pressure	40–45 lbs. per sq. in.
Oil consumption	2½ pints per hour

VICKERS SUPERMARINE "STRANRAER FLYING BOAT"

GENERAL CATEGORY AND TYPE

Twin-engined flying boat for service at home and overseas, made by The Supermarine Aviation Works (Vickers) Ltd. It is a biplane of all-metal construction, and a development of the "Southampton" and "Scapa" boats, having considerably more internal accommodation and a much higher performance.

ACCOMMODATION

The "Stranraer" operates as a completely self-contained unit with comfortable working and living accommodation for the crew.

HULL CONSTRUCTION

The hull construction is of "Alclad," with main attachment fittings of stainless steel. An enclosed cabin with sliding roof and side panels provides an exceptionally good view in all conditions of weather.

POWER PLANT

The power installation consists of two "Bristol" Pegasus medium supercharged engines. An engine changing derrick can be supplied for use while it is afloat and provision is made for the transport of a spare engine on the bottom centre section.

PERFORMANCE

It is claimed that the performance obtained during a series of extended service trials, whether in respect of speed, climb, ceiling or take-off, is unequalled by any other British flying boat. All the specification requirements were exceeded by large margins. The severe test of flying with one engine stopped was easily accomplished and careful observation showed that there was no over-heating of the engine used to maintain flight.

HORNET MOTH (D.H. 87B)

DESCRIPTION

TYPE

A cabin biplane of wood construction, with folding wings, for two persons and luggage, designed to serve as an economical, safe, comfortable and essentially practical tourer and as an *ab initio* trainer according to the new principle of seating the instructor and pupil side by side in a pleasant saloon with full dual control, thus eliminating head phones, helmets and cumbersome clothing. Makers : The de Havilland Aircraft Co. Ltd., Hatfield Aerodrome, Herts. Available as a seaplane and considerably employed in that form.

FLYING CHARACTERISTICS

High standard of positive stability about all axes, which greatly simplifies learning to fly ; the Hornet Moth can be flown hands off. There is an excellent view from either seat. Air brakes for steep glide. Wheel brakes for short landing run and easy ground manœuvring ; fully castoring tail wheel.

ENGINE

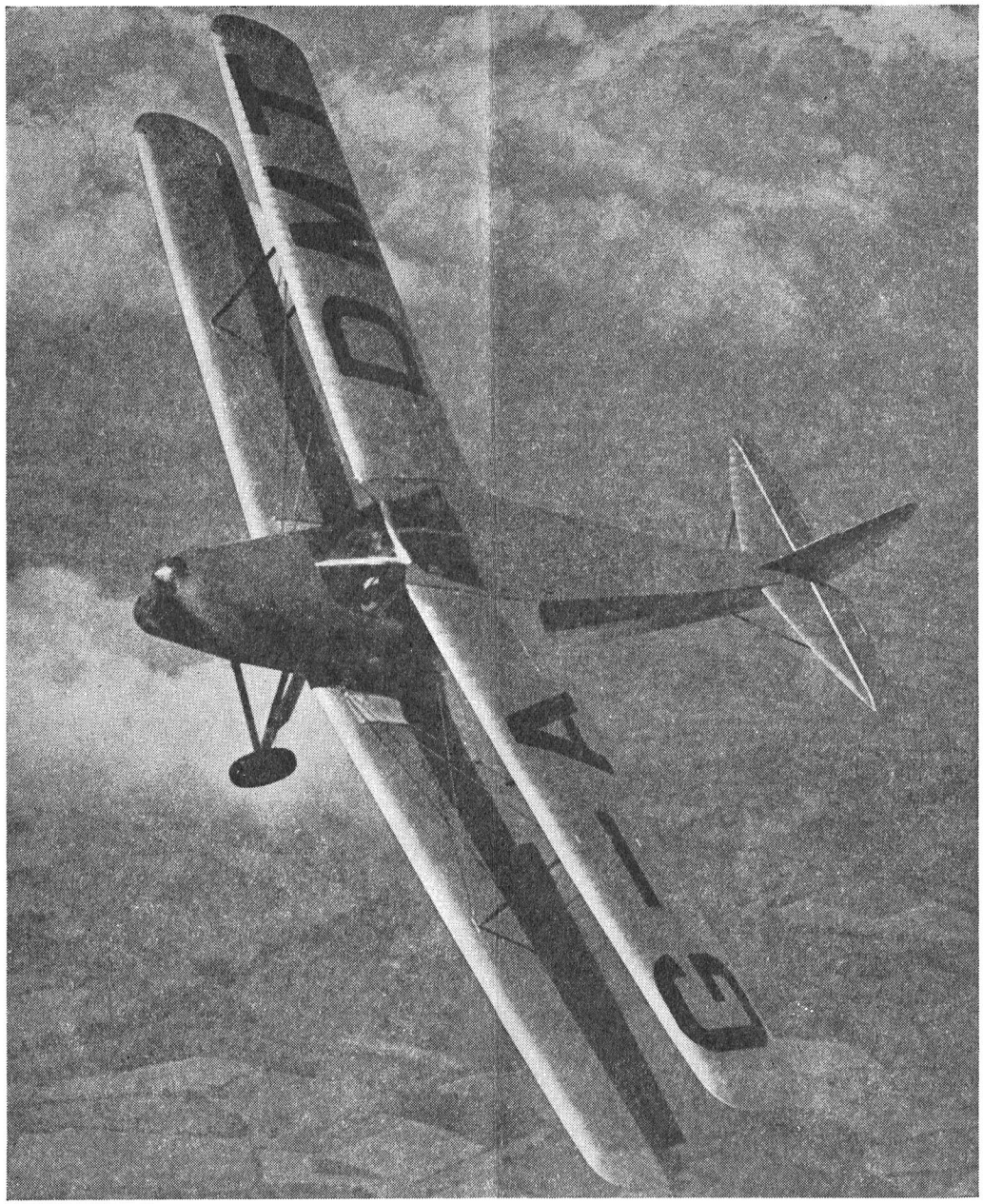
Gipsy Major 130 h.p.

OIL PRESSURE

40–45 lb./sq. in.

DIMENSIONS

Length	24 ft. 11½ in.
Span	31 ft. 11½ in.
Width (wings folded)	10 ft. 9½ in.
Height overall	6 ft. 7 in.



WEIGHTS

Weight unladen	1,255 lb.
Maximum loading :	
Fuel (35 gal.) *	270 lb.
Oil (2·6 gal.)	25 lb.
Crew (2)	320 lb.
Luggage	130 lb.

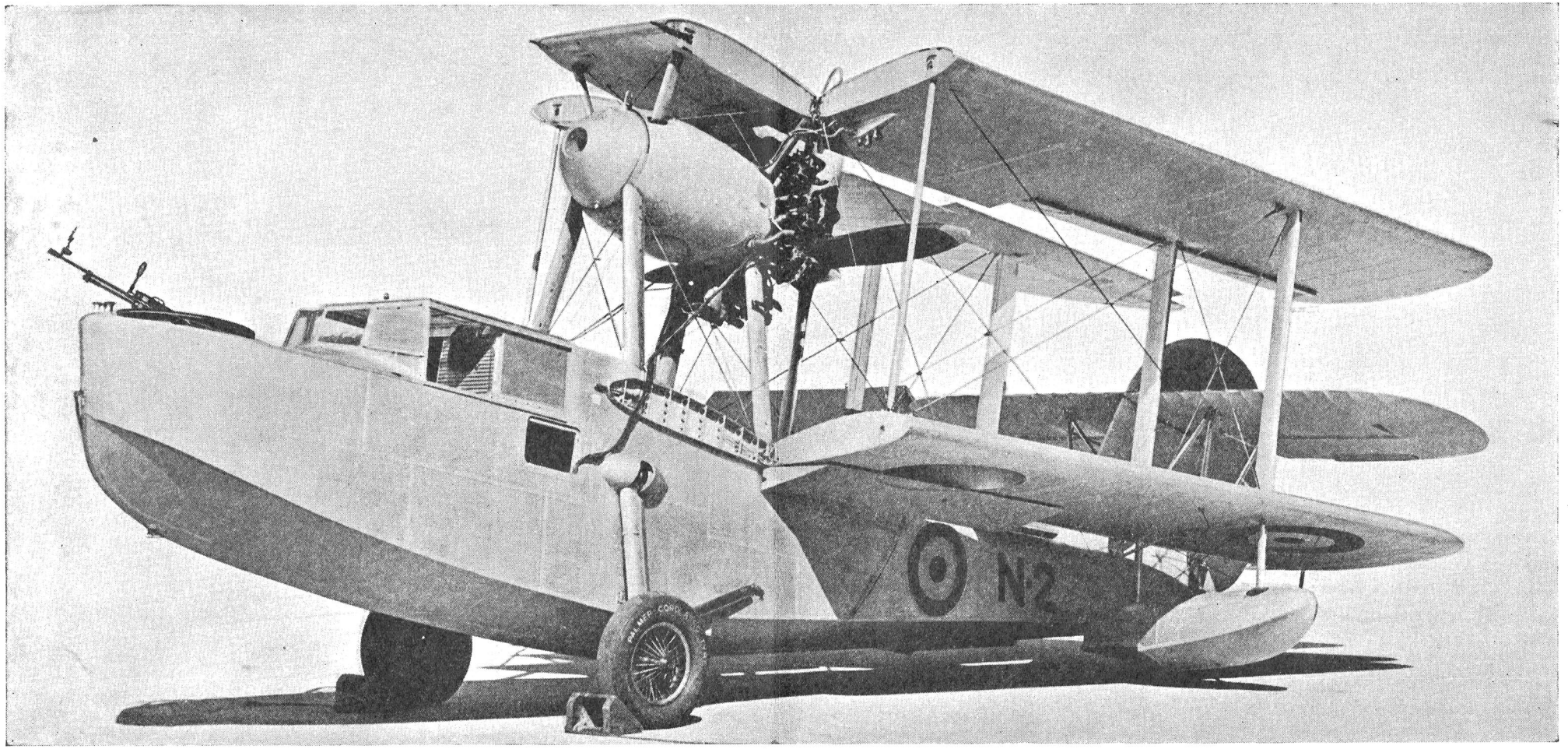
* All-up weight 2,000 lb.

PERFORMANCE

LOADED TO 2,000 lb.

Maximum speed (at sea level)	124 m.p.h.
Cruising speed at 1,000 ft.	105 m.p.h.
Cruising fuel consumption	5·9 gal./hr.
Ultimate range with 35 gal.	623 miles
Indicated stalling speed	40 m.p.h.
Take-off run in 5 m.p.h. wind	160 yds.
Height at 400 yds. from rest in 5 m.p.h. wind	75 ft.
Landing run with wheel brakes in 5 m.p.h. wind	100 yds.
Rate of climb at sea level	690 ft./min.
Time to climb to 5,000 ft.	8·75 min.
Service ceiling	14,300 ft.
Oil consumption	1·25 pints per hour (approx.)

VICKERS SUPERMARINE "WALRUS" AMPHIBIAN FLYING BOAT



GENERAL CATEGORY AND TYPE

"Walrus" is a single-engined (pusher) biplane amphibian flying boat.

It is designed for service with naval cruisers and aircraft carriers for reconnaissance, fleet spotting, photographic and training purposes. Makers: The Supermarine Aviation Works (Vickers) Limited, Southampton. "Walrus" will be carried by vessels equipped with catapult launching gear. It was the first military aircraft with a retractable undercarriage to be adopted by the Royal Air Force and the first amphibian aircraft to be catapulted with full military load. Slinging gear is provided for hoisting on board on the conclusion of a flight.

CONSTRUCTION

Almost entirely of metal, stainless steel and duralumin; the fabric covered superstructure has spars of stainless steel. The large hull ensures very clean running under rough water conditions.

For stowage purposes the wings can be easily and quickly folded.

ACCOMMODATION

The pilot and navigator have a clear field of view, unrestricted by floats or wings from the enclosed cockpit forward of the superstructure.

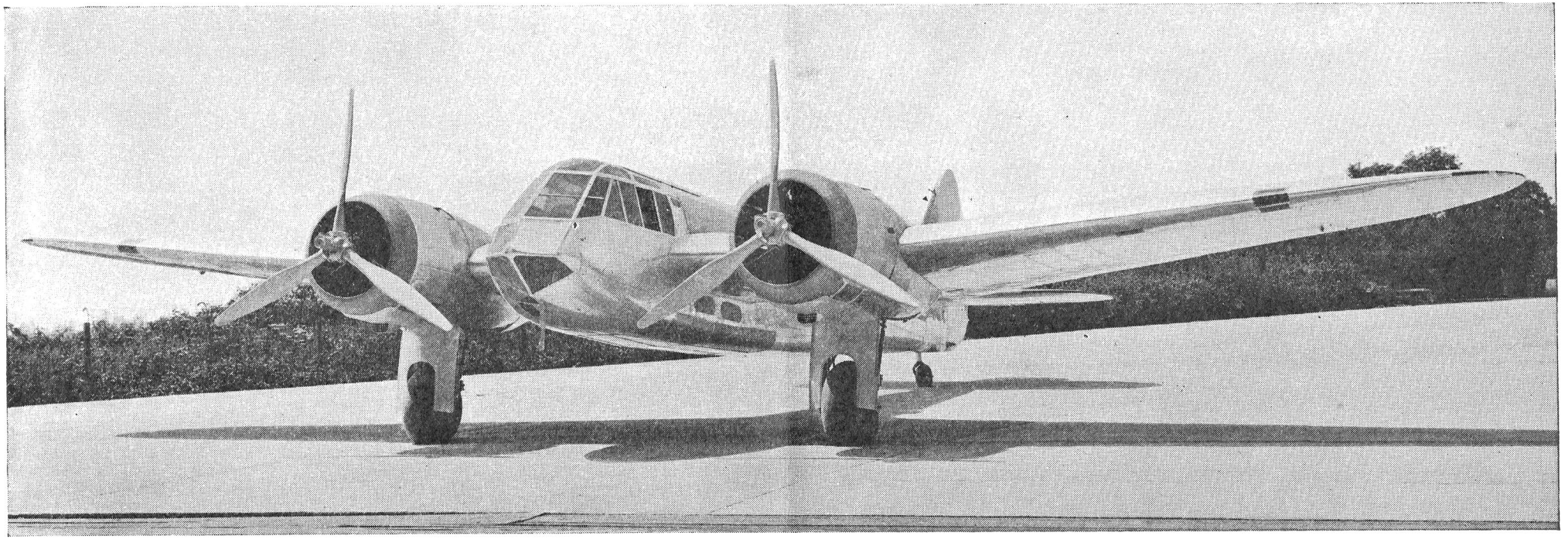
UNDERCARRIAGE

A retractable undercarriage, hydraulically operated, provides for landing on an aerodrome or on the sea. In the raised position the wheels are housed in recesses in the bottom main planes.

POWER PLANT

"Bristol" Pegasus Engine.

"BRISTOL" BLENHEIM BOMBER



GENERAL CATEGORY AND TYPE

Twin-engined high-performance medium-bomber aeroplane.

The "Bristol" Blenheim Bomber (Type 142M) is a military version of the "Bristol" Type 142 all-metal low-wing monoplane, fitted with two "Bristol" Mercury engines, which was built for Lord Rothermere and presented by him to the nation in 1935 as the fastest aeroplane of its class in the world ("Britain First"). The following is the only information which is available for publication at the present time.

POWER PLANT

Two "Bristol" Mercury VIII air-cooled radial engines.

ACCOMMODATION

Three, as a bomber

OVERALL DIMENSIONS

Length	39 ft. 9 in.
Span	56 ft. 6 in.
Height	9 ft. 9 in.

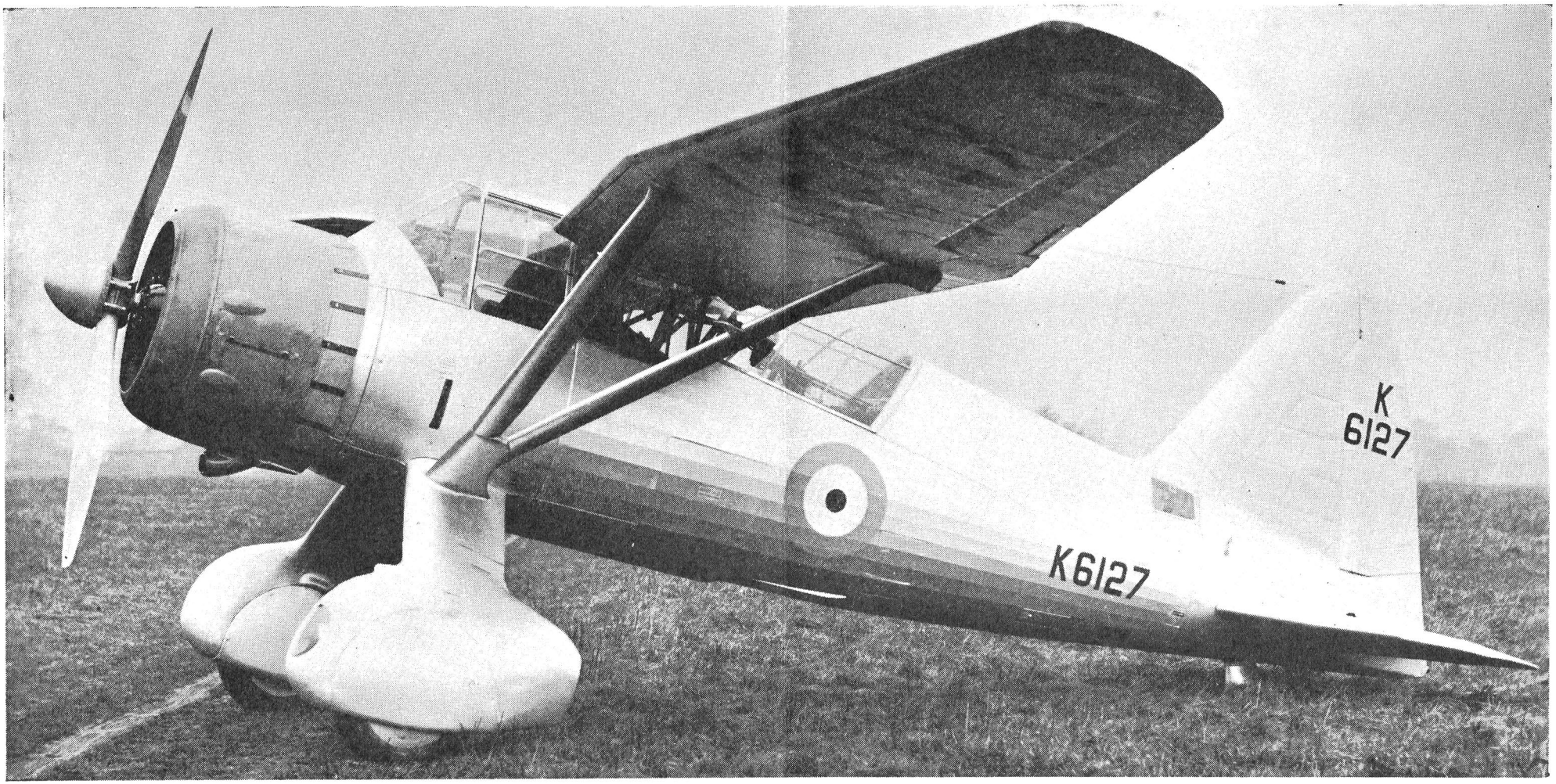
WINGS

Mid-wing monoplane, all-metal construction, with hydraulically-operated retractable undercarriage and split trailing-edge flaps.

FUSELAGE

Monocoque, all-metal, stressed-skin construction.

WESTLAND "LYSANDER" MONOPLANE



TYPE

High-wing monoplane, designed and built by Westland Aircraft Ltd. for air liaison with the Army, including artillery spotting, reconnaissance and photography, officially known as "Army Co-operation" work. Operational requirements: All-round view for the pilot, ability to operate from small temporary landing-grounds, wide range of speed, *i.e.*, slow speeds with good stability for spotting and reconnaissance, and high speed to enable pilot to proceed to and from the scene of operations as quickly as possible.

ACCOMMODATION

For pilot and observer. Pilot placed in front of, and level with, the leading edge of the wings.

Large transparent sliding doors on either side with a transparent sliding roof.

Observer's position at trailing edge of wing in a large cabin which is continuation of pilot's. Also provided with a sliding roof.

Cabin heated by fresh air warmed by passage round the oil-coolers. Heating independently controlled by pilot and observer.

WINGS

High-wing monoplane. Single-spar construction. Wing bracing by means of "V" struts, which are attached to undercarriage member at points remote from fuselage. Handley Page wing tip and root slats, and trailing edge slotted flaps; the operation of flaps is automatic, the position of which is controlled by speed of aeroplane.

ENGINE

Bristol "Mercury."

UNDERCARRIAGE

The undercarriage, which differs considerably from previous cantilever types, consists of a beam which is bent round in one piece to a horseshoe form.

Shock absorbing obtained by use of internally-sprung wheels attached to each end of under-carriage beam by means of stub axles. The whole undercarriage is completely faired in, the leg fairings blending into the wheel fairings.

MILES HAWK TRAINER MARK II

BRIEF DESCRIPTION

TYPE

The Miles " Hawk " Trainer is a low-wing monoplane of wooden construction with seats in tandem. Makers: Phillips & Powis Aircraft Ltd.

DUAL CONTROL

It is fully dual-controlled and possesses instruments duplicated in each cockpit. Equipped with Miles patented split trailing-edge flaps and wheel brakes.

SPECIAL EQUIPMENT

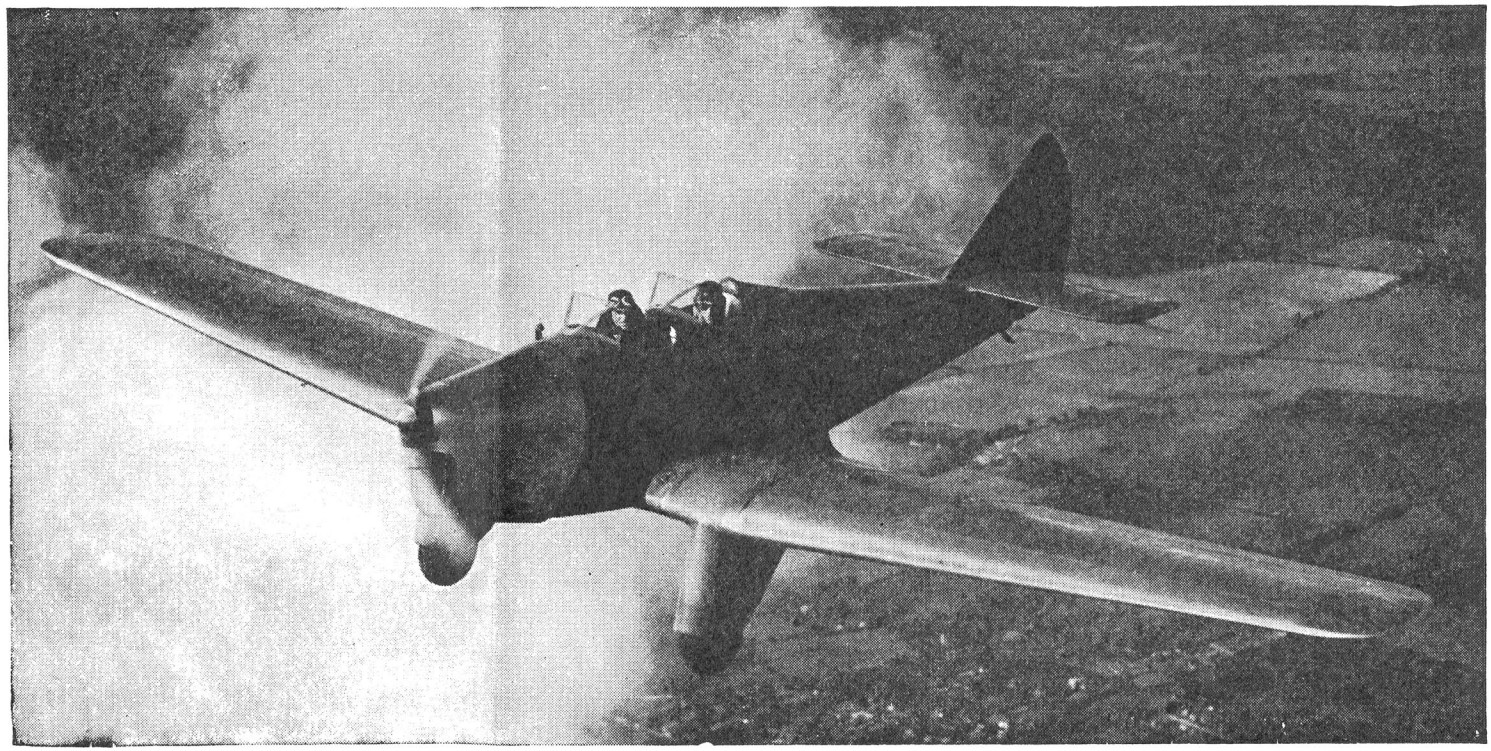
Special parachute seats are provided and provision has been made for the fitting of a blind flying hood.

ENGINE

De Havilland Gipsy Major 130 h.p.

OIL PRESSURE

40–45 lbs. per sq. in.



PERFORMANCE

Maximum speed at sea level	145 m.p.h. (233 k.m.p.).
Cruising speed at sea level (at 2,100 revs.)	130 m.p.h. (209 k.m.p.).
Rate of climb at sea level	1,200 ft./min. (364 m./min.).
Take-off run (with flaps)	170 yds. (155 m.).
Landing run (with flaps and brakes)	100 yds. (91 m.).
Landing speed	45 m.p.h. (72 k.m.p.).
Fuel consumption at cruising speed	6½ gals./hr. (29.5 lt./hr.).
Oil consumption	1.75 pints per hour.
Range (22 gals.) (100 lt.)	400 miles (643 km.).
Maximum ceiling	22,000 ft. (6,700 m.).

DIMENSIONS AND WEIGHTS

DIMENSIONS

Height	7 ft.
Length	24 ft.
Span	34 ft.
Span (wings folded)	13 ft. 10 in.

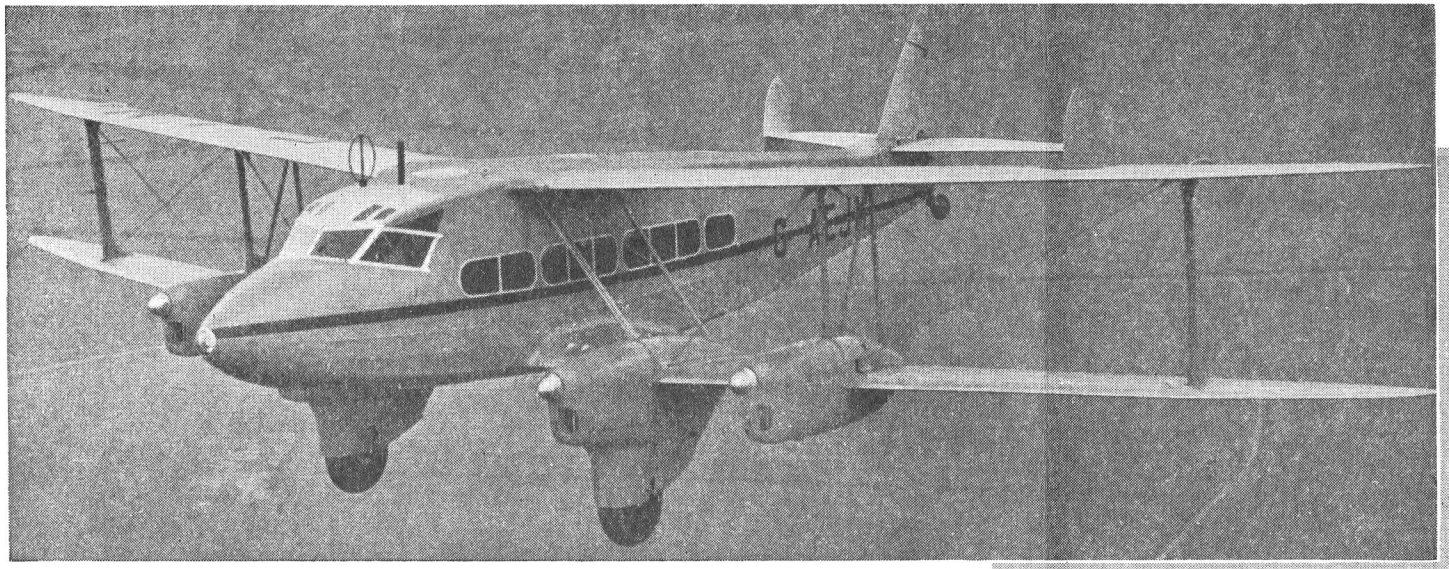
WEIGHT UNLADEN

1,240 lbs.

MAXIMUM LOADING

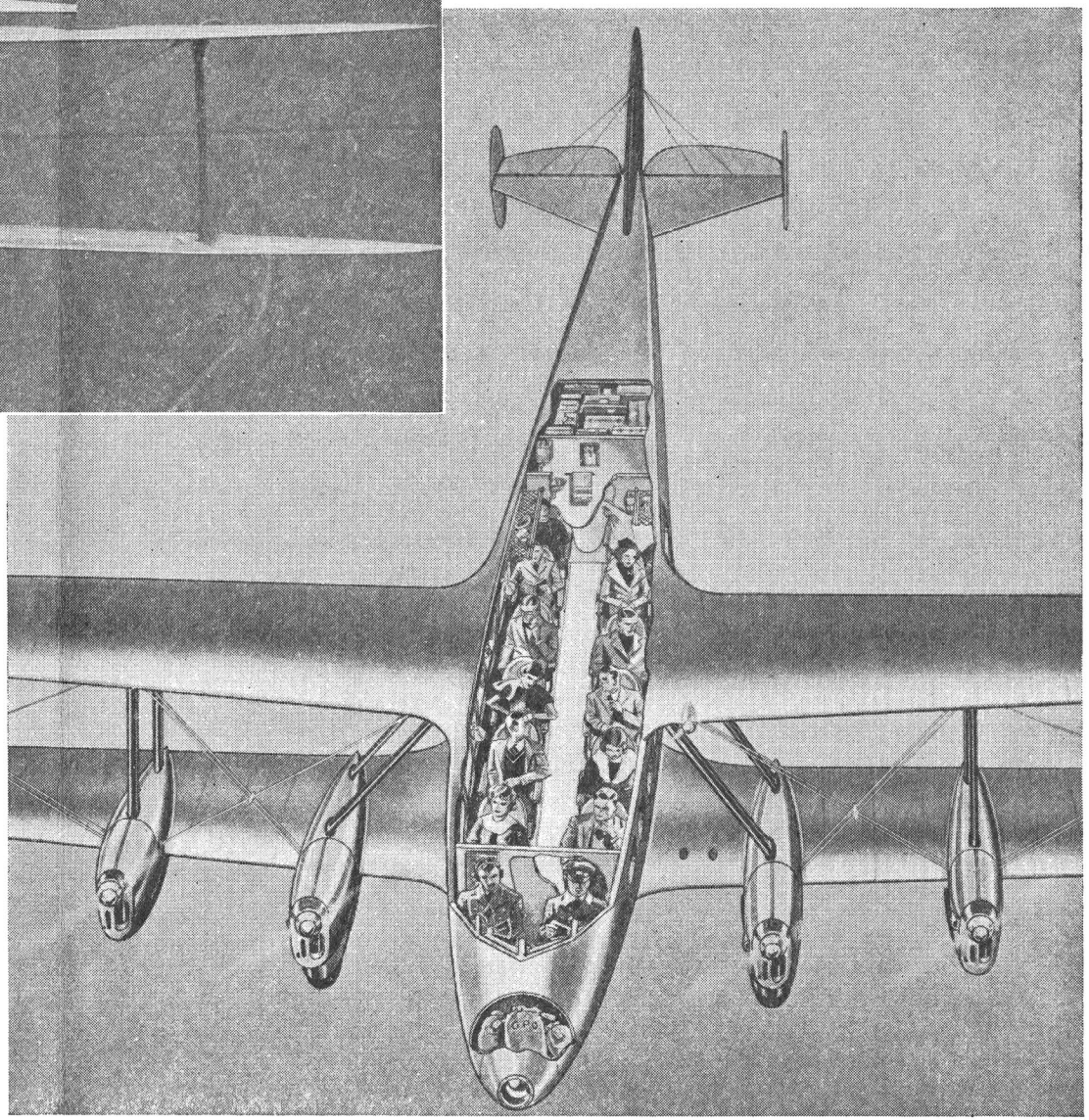
Aerobatic category	1,750 lbs.
Normal category	1,900 lbs.
Fuel	154 lbs.
Oil	22 lbs.
Crew	170 lbs.
Payload (aerobatic)	164 lbs.
Payload (normal)	314 lbs.

THE EXPRESS AIR LINER (D.H. 86B)



ACCOMMODATION

See below. Ten or twelve passengers, or up to seventeen passengers on short-stage flights.



TYPE

A four-engined public-transport liner for major air routes, made by the de Havilland Aircraft Co. Ltd., Hatfield. Biplane of wood construction. Designed particularly for economy and safety.

PERFORMANCE

Transports payload of about 2,000 lb. at 140 m.p.h., although powered by four engines whose maximum output is only 800 h.p. Flies full load with any two engines out of action.

FUEL CONSUMPTION

35·5 gals./hr.

OIL CONSUMPTION

Approx. 10 pints per hour.

PRINCIPAL USERS

Imperial Airways, fleet of approximately twelve on major lines across Europe, Africa and South-east Asia.

Qantas Empire Airways, 361-mile Brisbane Singapore section of main line to Australia.

DIMENSIONS

Span 64 ft. 6 in., length 46 ft. 1¼ in., height 13 ft.

ENGINES

Four Gipsy Six I of 200 h.p.

OIL PRESSURE

40–45 lb./sq. in.

WEIGHTS

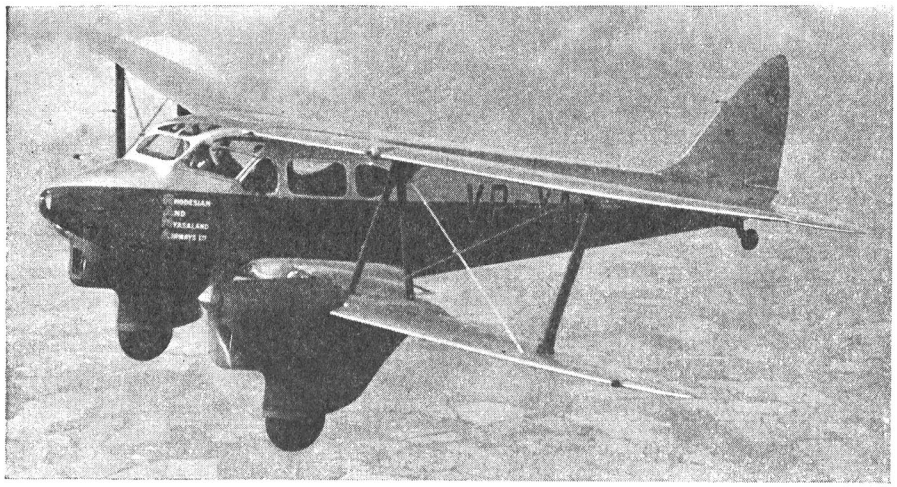
Weight unladen, 6,250 lb.

MAXIMUM LOADING

Fuel	* (114 g.) 878 lb.
Oil	(12 g.) 108 lb.
Crew	(2) 340 lb.
Wireless	approx. 120 lb.
Furnishing	„ 335 lb.
Lavatory	„ 35 lb.
Payload	2,184 lb.

* For a range of 450 miles. (Or payload 1,555 lb. with 191 gallons for 750 miles.)

DRAGONFLY (D.H. 90)



TYPE

A twin-engined biplane of wood construction, seating five, made by the de Havilland Aircraft Co. Ltd., suitable for private ownership, personal, state or executive journeys, private-charter work, the pioneering of new air lines, air ambulance and medical services, photography and survey, civil and military training in multi-engine piloting according to modern technique, wireless, navigation, etc. Having flaps, differential aileron control, wheel brakes and side-by-side dual control, the Dragonfly is designed to reproduce flying characteristics of the latest types of air liner and larger military aircraft. It can be equipped with a hood and duplicated instrument panel for instructing in blind flying with multi-engined type of aircraft. Navigation lighting and landing searchlight provided as standard. Large tanks for long-range duty.

ENGINE

Two Gipsy Majors of 130 h.p. Oil Pressure, 40-45 lb. per square inch.

DIMENSIONS

Length	31 ft. 8 in.
Span	43 ft.
Height	9 ft. 2 in.

FUEL CONSUMPTION

12 gals. per hour.

OIL CONSUMPTION

Approx. 2.5 pints per hour.

WEIGHT UNLADEN

2,550 lb.

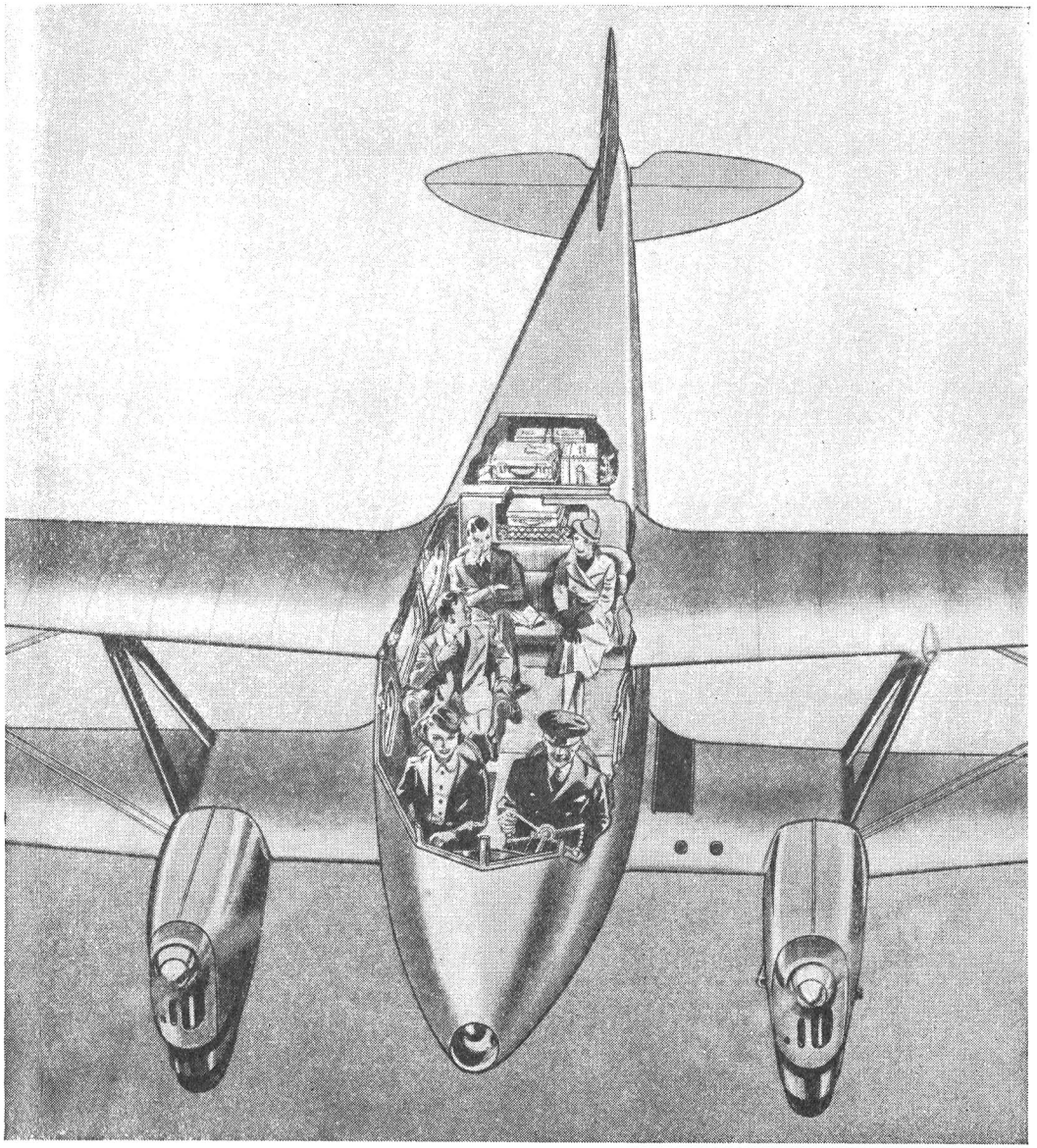
MAXIMUM LOADING

Petrol (60 gals.) *	462 lb.
Oil (7 gals.)	63 lb.
Crew (1)	160 lb.
Payload : Passengers (4)	640 lb.
Luggage	125 lb.
All-up weight	4,000 lb.

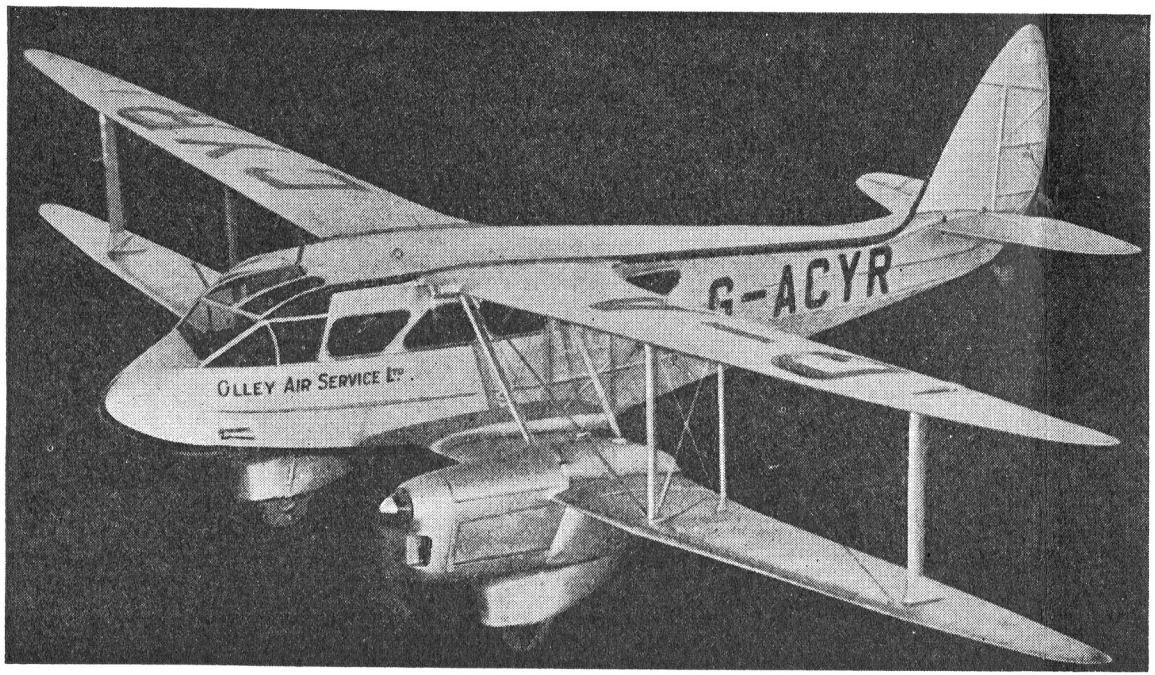
* For a range of 625 miles.

ACCOMMODATION

See illustration below. Five-seat cabin with side-by-side dual control. Separate luggage compartment.



DRAGON RAPIDE (D.H. 89A)



[Photo : "Flight"

TYPE

A small two-engined air-liner or private-charter biplane of wood construction for six or eight passengers, made by the de Havilland Aircraft Co. Ltd. Designed for economical operation and suitable for feeder-line transport services operating with little or no financial subsidy. Available as a seaplane, and employed in this form in Canada, etc., with ski undercarriage for winter operation. Also available as military aeroplanes for various duties, notably as a general-purpose self-defending reconnaissance bomber, and for training of crews of military aeroplanes. In civil form it is also used extensively by private owners and for private, state and industrial travel.

SPECIAL EQUIPMENT

Latest model embodies more comprehensive equipment, including improved heating, ventilation and sound-proofing, flaps for steep approach, landing searchlight and generally improved night-flying provisions.

ENGINE

Two Gipsy Six I of 203 h.p.

DIMENSIONS

Length . . .	34 ft. 6 in.
Span . . .	48 ft. 0 in.
Height . . .	10 ft. 3 in.
Track . . .	11 ft. 6 in.

FUEL CONSUMPTION

18 gal./hr.

OIL CONSUMPTION

Approx. 5 pints per hour.

OIL PRESSURE

40–45 lb./sq. in.

WEIGHT UNLADEN

3,260 lb.

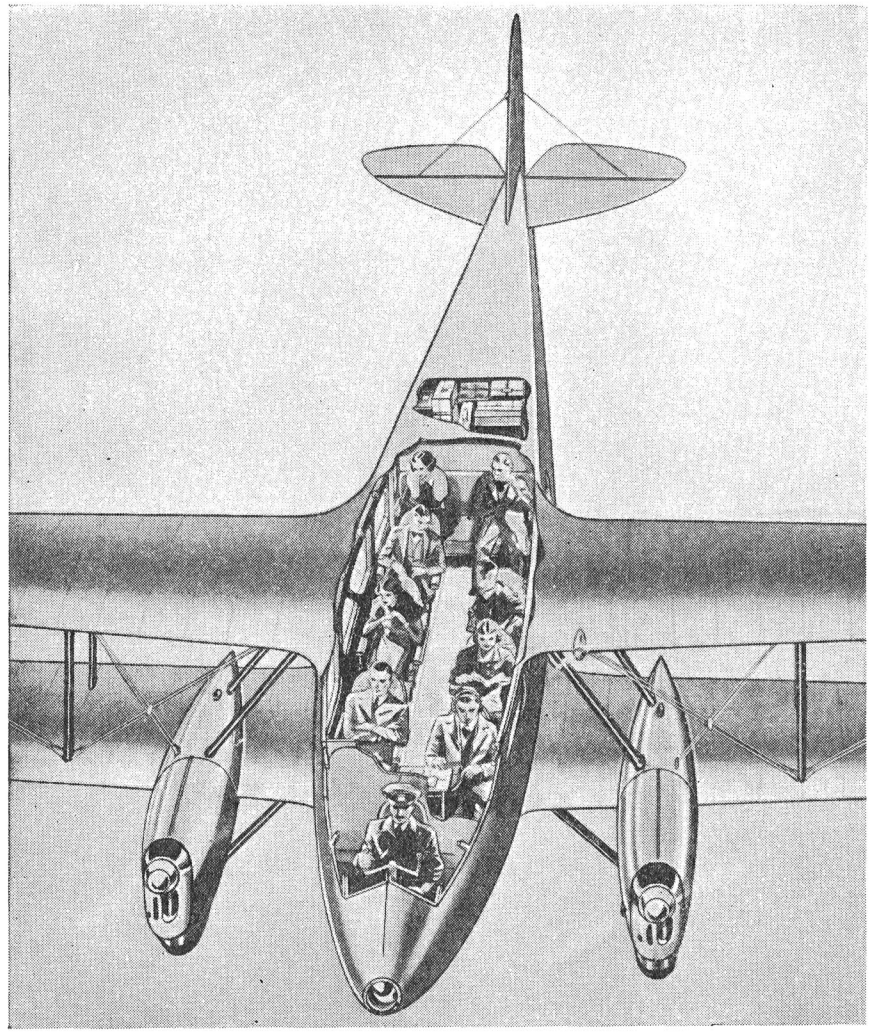
MAXIMUM LOADING

Fuel . .	(76 g.)	585 lb.
Oil . .	(7 g.)	63 lb.
Crew . .	(1)	170 lb.
All-up weight .		5,550 lb.

Balance of 1,452 lb. available for cabin furnishing (say 140–150 lb.) and payload, including six or eight passengers, luggage and/or freight.

ACCOMMODATION

Single-control cabin in nose, passenger saloon of generous dimensions for an aeroplane of this size, toilet and luggage compartments at rear.



TIGER MOTH (D.H. 82A)

DESCRIPTION

TYPE

An *ab initio* and intermediate trainer for both military and civil schools. Makers : The de Havilland Aircraft Co. Ltd., Hatfield Aerodrome, Herts. Biplane with metal fuselage and fabric-covered wood wings; tandem open cockpits for instructor and pupil, with full dual control. Has adequately high performance to permit instruction without loss of time in gaining height, yet is safe for the inexperienced.

APPLICATION

Reproduces closely the handling characteristics of powerful military aeroplanes and is very highly manœuvrable so that it is admirably suited for aerobatic training, particularly because of its ability to recover quickly and safely from all aerobatic attitudes. It is widely employed for instruction in specialised military duties such as formation flying, photography and bombing, and can be equipped with a hood for the complete blind-flying course. It is available as a seaplane and can be equipped with skis.

The Tiger Moth is employed at most of the R.A.F. Reserve Training Schools in Great Britain and by some twenty-five foreign governments in all parts of the world. It is widely and most successfully employed in civil schools and clubs.

ENGINE

Gipsy Major 130 h.p.

OIL CONSUMPTION

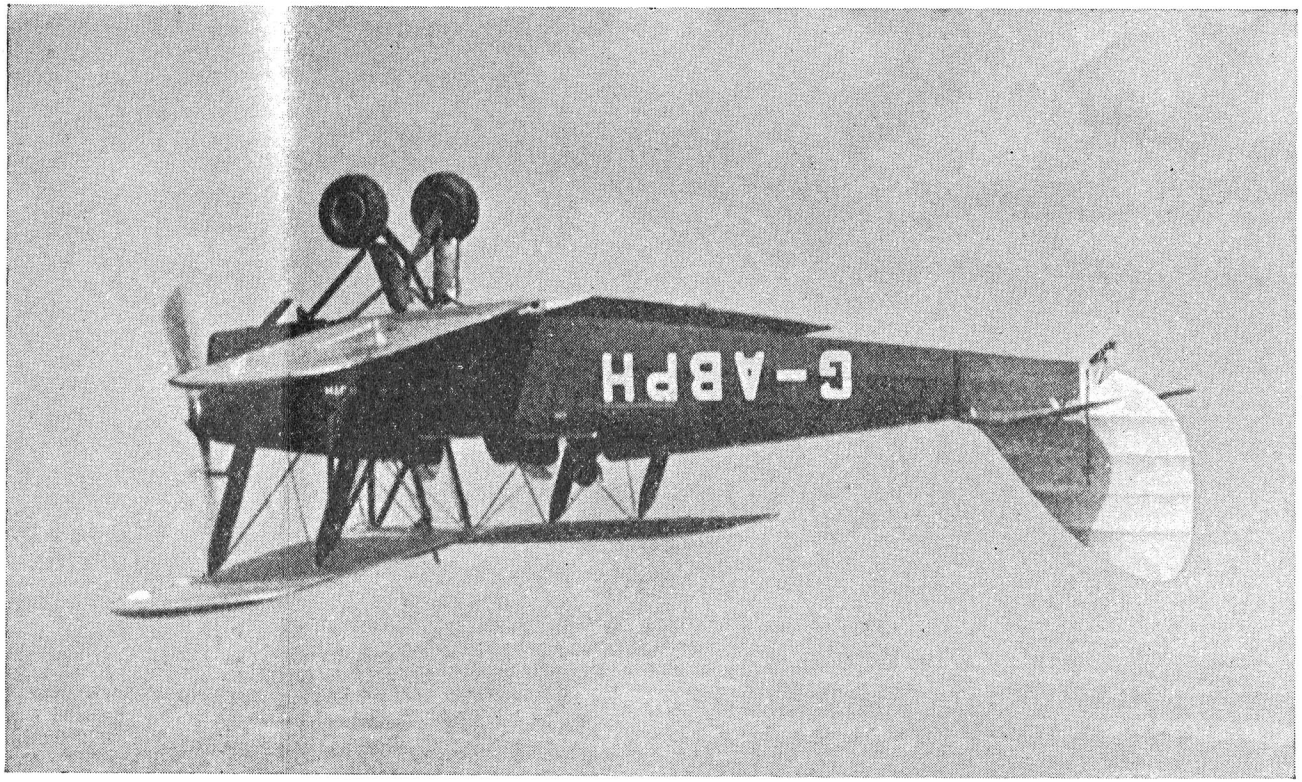
Approximately 1·75 pints per hour.

FUEL CONSUMPTION

6·0 gallons/hr.

OIL PRESSURE

40–45 lb./sq. in.



[By courtesy of "Flight."]

WEIGHTS AND DIMENSIONS

WEIGHT UNLADEN

1,115 lb.

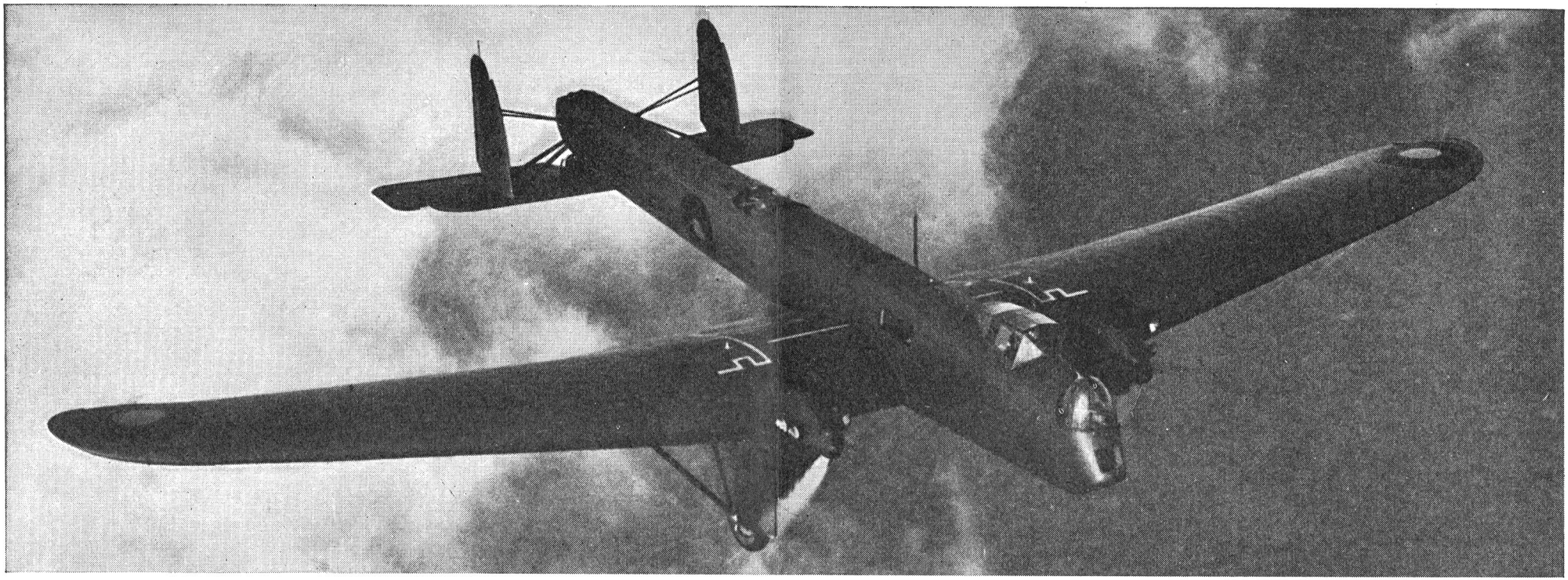
DIMENSIONS

Length	23 ft. 11 in.
Span	29 ft. 4 in.
Height overall	8 ft. 9½ in.
Track	6 ft. 4½ in.

LOADING

Fuel (19 gals.)	146 lb.
Oil (2 gals.)	20 lb.
Crew (2)	320 lb.
All-up	1,601 lb.
Max. for aerobatic C. of A.	1,770 lb.
Max. for normal C. of A.	1,825 lb.

FAIREY "HENDON" LONG RANGE NIGHT BOMBER



TYPE

The Fairey "Hendon" is a cantilever twin-engined monoplane, designed for long range night bombing operations.

DIMENSIONS

Length	74·2 ft.
Span	101·75 ft.
Height	20·75 ft.

ENGINES

Two Rolls-Royce "Kestrel" VI.

ACCOMMODATION

The bomb load is stowed within the thickness of the wing, the bombs falling through trap doors in the lower surface of the planes.

Accommodation is provided for a normal crew of four men. The gun stations are wind shielded, and are situated in the nose, amidships, and in the tail, commanding a clear field of fire in all directions.

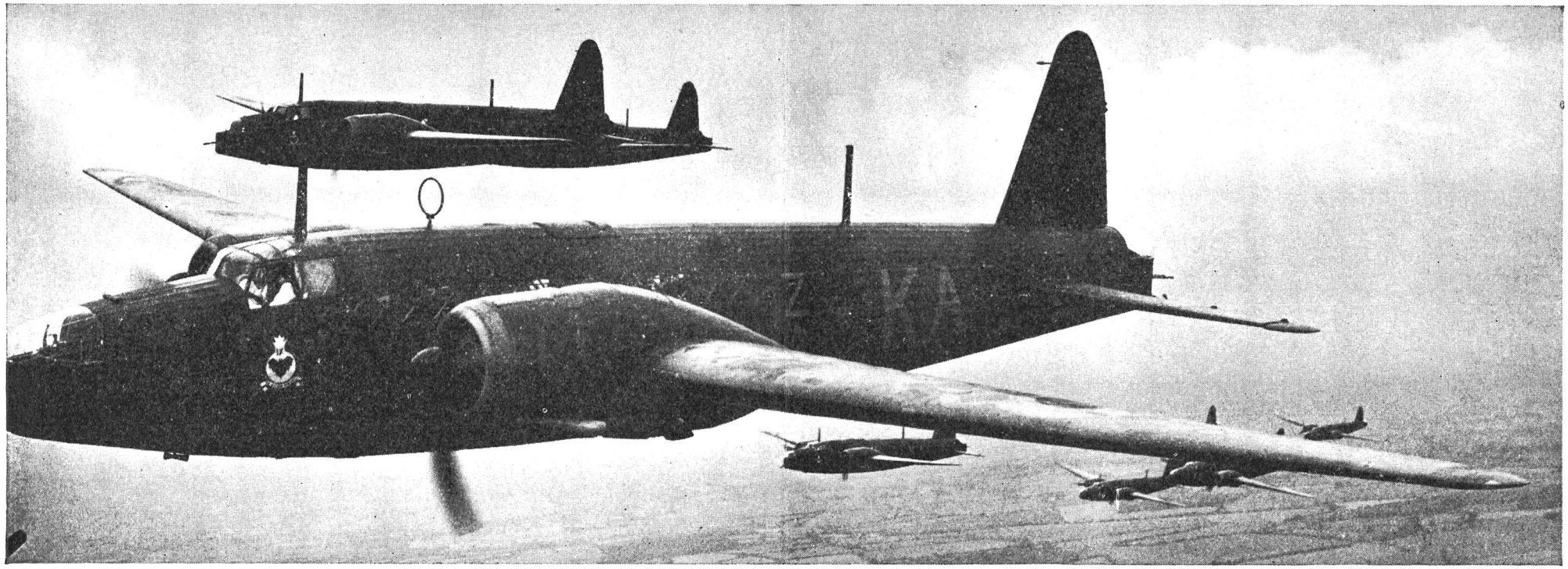
CONSTRUCTION

The primary structure is of steel throughout, either in the form of tube or drawn section, duralumin and light alloys being used for secondary structure. The covering is mainly fabric.

The engines are mounted in steel tube cradles attached to the front spar, with the fuel, oil and water tanks immediately behind them. Provision is made on the engine mountings for the attachment of a derrick by means of which the engines can be removed and replaced without external support.

Fittings are arranged on the mounting and undercarriage for a working platform from which all parts of the engine installation are accessible.

VICKERS "WELLINGTON I"



TYPE

A twin-engined tractor monoplane as long-range bomber, made by Vickers-Armstrongs Ltd., Weybridge.

ENGINES

Two Bristol Pegasus XVIII.

PERFORMANCE OF ENGINE

International rating	815 b.h.p. at 4,750 ft. and 750 h.p. at 14,750 ft.
Max. h.p. in flight	885 b.h.p. at 15,500 ft.

GENERAL DESCRIPTION

Mid Wing : Geodetic construction ; fabric covered, retractable undercarriage ; constant speed airscrews.

DIMENSIONS

Span	86 ft.
Length (Tail down)	61 ft. 3 in.
Height (Tail down)	17 ft. 5 in.
Full complement of crew, including pilot	Five
Max. fuel capacity	1,000 gallons
Max. oil capacity	47 gallons
Normal flying weight	24,850 lb.
Surface loading	29·6 lb./sq. ft.
Take-off power loading	12·8 lb./h.p.

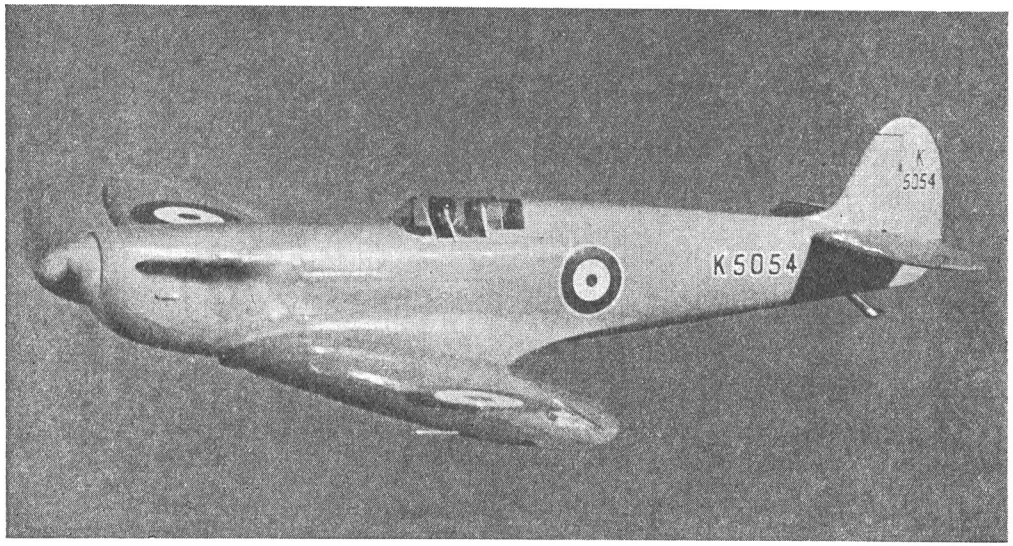
Number and general position of guns : 1 forward fuselage ; 2 rear fuselage.

PERFORMANCE

Absolute max. speed in level flight : 265 m.p.h. at 17,000 ft.

Normal cruising speed	215 m.p.h. at 15,000 ft.
Max. range with full tanks	3,200 miles at 180 m.p.h.
Service ceiling	26,300 ft.
Time to climb to 15,000 ft.	18 min.

VICKERS
SUPERMARINE "SPITFIRE I"



[By courtesy of "Flight."

TYPE

Single-seater, day and night fighter. This is the latest product of the Supermarine Aviation Works (Vickers) Limited, of Southampton, and is the fastest military aeroplane in the world. It is of exceptionally clean design, and much of the pioneer work carried out by the Supermarine Company in the design and construction of the Schneider Trophy seaplanes has been made use of.

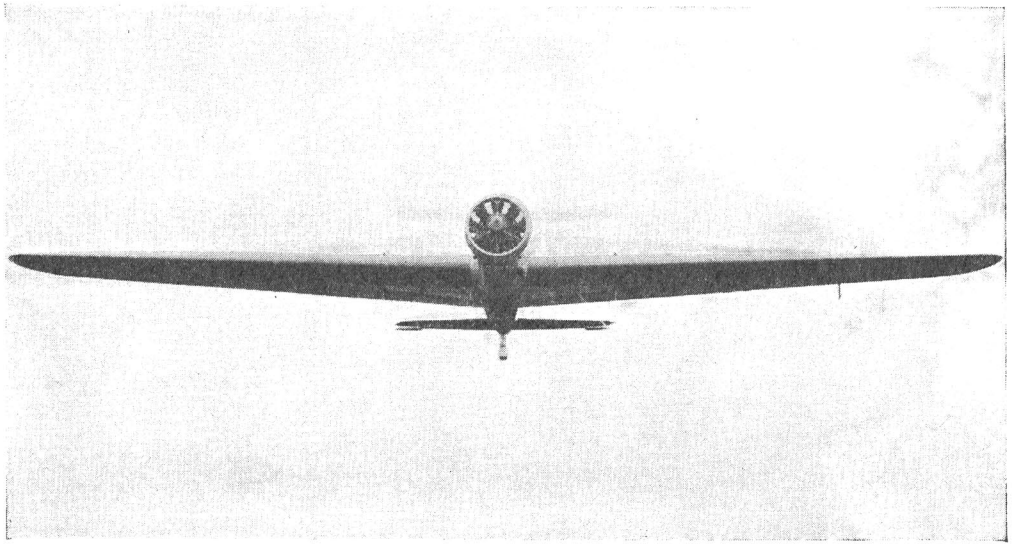
ENGINE

Rolls-Royce Merlin engine.

CONSTRUCTION

It is an all-metal low wing monoplane equipped with retractable undercarriage and with wing flaps. The latest technique developed by the Supermarine Company in stressed skin construction has been used. This construction gives exceptional stiffness to wings and fuselage for a structure weight never before attained for this class of aeroplane, and also gives a perfectly smooth outer surface so essential for very high speeds.

VICKERS
"WELLESLEY"



TYPE

A single-engined tractor monoplane, as long-range bomber or general-purpose aeroplane, made by Vickers (Aviation) Ltd., Weybridge.

ACCOMMODATION

Enclosed cockpits for Pilot and Gunner with intercommunication between them.

DIMENSIONS

Span	74 ft. 7 in.
Height	12 ft. 4 in.
Length	39 ft. 3 in.

ENGINE

Bristol "Pegasus" engine of nine cylinders, air-cooled radial, geared ·5 to 1, supercharged ; fitted with combined Townend exhaust ring and cowl.

CONSTRUCTION

The aeroplane is of all-metal "geodetic" construction, principally duralumin. Aeroplanes built on this principle combine in a marked degree great stiffness and strength with a structure weight so low as to give range and load-carrying figures that have hitherto been considered unattainable. Interior of both wings and fuselage is entirely unobstructed, leaving the full volume available for stowage, passenger quarters, tanks, etc., etc.

An hydraulic retractable undercarriage is fitted, low pressure wheels and swivelling tail wheel.

Frise ailerons and split flaps are fitted to the wings.

The exterior surface is preferably covered with fabric. Hamilton V.P. airscrew is fitted.

THE FAIREY "BATTLE" BOMBER

TYPE

The Fairey "Battle" high performance medium bomber type aeroplane is a single-engined monoplane designed for long range day bombing. It is made by The Fairey Aviation Co. Ltd., Hayes, Middlesex.

ACCOMMODATION

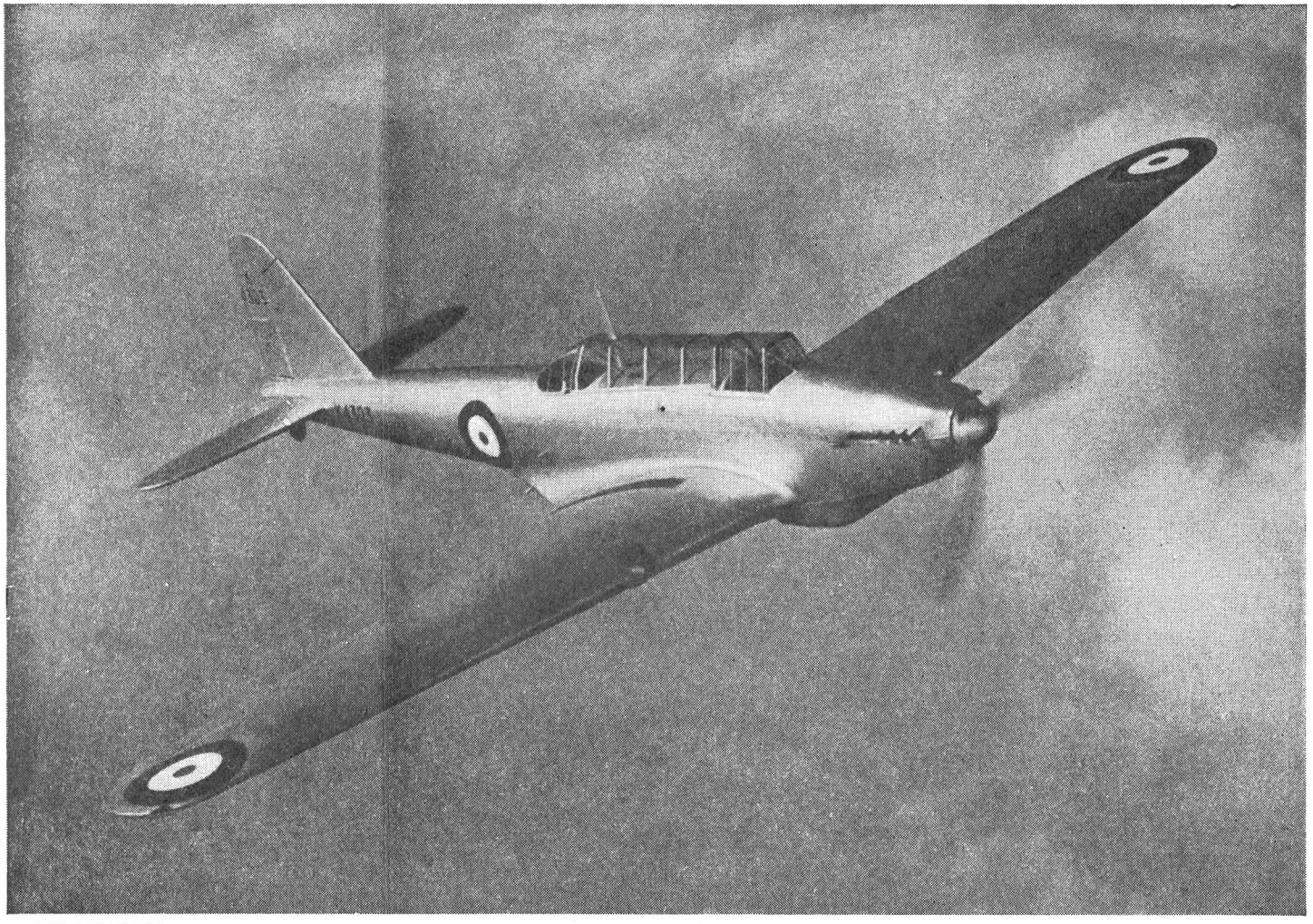
Provision is made for a crew of two, the rear occupant carrying out the duties of rear gunner, prone bomber, etc.

CONSTRUCTION

Stressed skin construction is used throughout, except for the pilot's cockpit portion of the fuselage. Main planes, tail plane and fin are metal covered, but fabric is used on ailerons, elevators and rudder. The pilot's cockpit and engine mounting are of steel tube construction.

UNDERCARRIAGE

A retractable undercarriage is fitted, and consists of two separate units hydraulically operated. Wing flaps and internal bomb gear are also worked hydraulically. A hand operated mechanism is provided for lowering the undercarriage in case of emergency.



ENGINE

Rolls-Royce "Merlin."

FUEL, OIL, COOLING

Fuel is carried in two tanks installed in the roots of the centre plane.

The oil system is of a simple type, cooled by means of a honeycomb radiator.

FUEL, OIL, COOLING—*continued*

Cooling is effected by means of glycol ethylene.

DIMENSIONS

Length overall	42 ft. 3 in.
Span	54 ft.
Height (rudder top to extended wheels)	15 ft.

DE HAVILLAND ALBATROSS

TYPE

The Albatross Transcontinental Airliner (D.H.91) is a high-speed public transport vehicle designed for luxurious world travel by day and by night. Furnished for main-line operation it accommodates a crew of four, twenty-two passengers and baggage, with a block-to-block range of 1,000 miles. It is available as a convertible sleeper with twenty-two seats by day or twelve full-size sprung berths by night. Commodious freight and luggage rooms, toilet compartments, kitchen, etc., are incorporated.

The Albatross has a high degree of purity of aerodynamic form and shows an exceptionally high power-economy factor, 6·07 ton-miles per gallon calculated on a range of 600 miles.

DIMENSIONS

Length	71 ft. 6 in.
Span	105 ft.
Height overall	22 ft. 3 in.
Track	17 ft.

ENGINES

Four Gipsy Twelves of 525 b.h.p.

OIL CONSUMPTION

Approximately 5 gals./hr.

OIL PRESSURE

60 lb./in.²

FUEL CONSUMPTION

80–84 gals./hr.

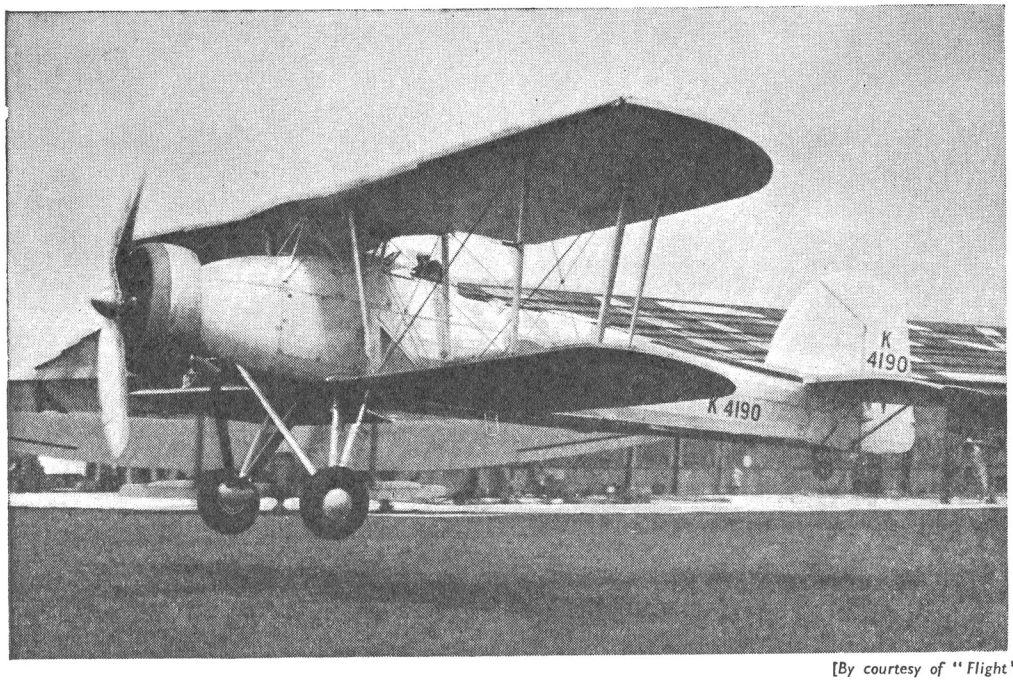
WEIGHTS

Unladen	21,230 lb.
Fuel for 1,000 miles	3,000 lb.
Crew of four	650 lb.
Oil	432 lb.
Payload	4,188 lb.
All-up weight	29,500 lb.

PERFORMANCE

Maximum speed	225 m.p.h. at 8,750 ft.
Cruising speed	210 m.p.h. at 11,000 ft.
Range with fuel	1,041 miles with 440 gals.
Take-off run in 5 m.p.h. wind	385 yds.
Rate of climb at sea-level	1,018 ft./min. on take-off power.
Service ceiling	17,900 ft.

THE FAIREY "SWORDFISH" TORPEDO-SPOTTER-RECONNAISSANCE



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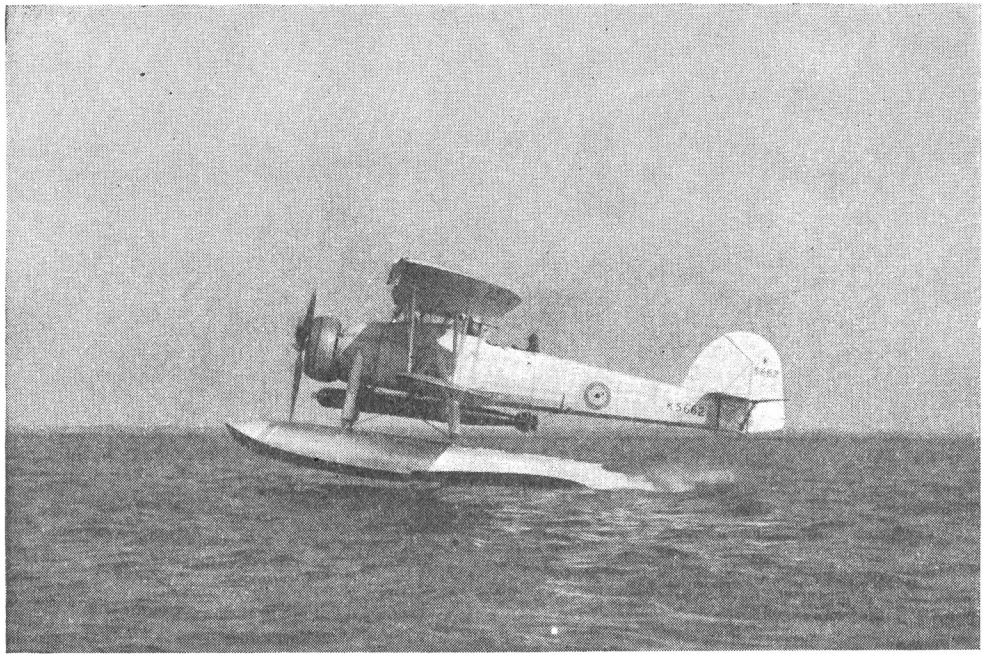


DESCRIPTION

TYPE

The Fairey "Swordfish," made by the Fairey Aviation Co. Ltd., Hayes, Middlesex, is designed to combine the functions of a Fleet Spotter Reconnaissance with those of a Torpedo Bomber. As either type the aeroplane will operate either on floats or wheels, the change-over from one to another being a simple operation.

Gear for deck arresting can be quickly installed when used as a deck-landing aeroplane, and ample flotation gear in the form of air bag and collapsible dinghy is provided. The aeroplane can also be catapulted.

ACCOMMODATION

Cockpit provision is made for three members of the crew, facilities being available for Observer, Gunner, Wireless Operator, Bomb Aimer and Photographer. For convenience in deck landing the wings are made to fold and spread rapidly.

CONSTRUCTION

Fuselage construction is made of steel tube, the front portion being metal-covered by detachable panels, and the rear portion fabric-covered.

Main planes, tail plane, fin and control surfaces are of metal construction, the strength-bearing members being of steel and the secondary structure of duralumin.

The main and auxiliary fuel tanks are situated amidships, in front of the pilot's cockpit.

DIMENSIONS

	Landplane	Seaplane
Length overall . .	36 ft. 4 in.	40 ft. ½ in.
Span (wings spread) .	45 ft. 6 in.	45 ft. 6 in.
Height . . .	12 ft. 10 in.	15 ft. 0 in.

ENGINE

Bristol "Pegasus" Mk. III.

BLACKBURN "SHARK"

DESCRIPTION

TYPE

A two- or three-seat biplane designed for the alternative duties of torpedo operation or bombing, fleet gunnery spotting and reconnaissance as a landplane, seaplane or ship-plane. Makers : Blackburn Aircraft Limited.

ACCOMMODATION

As a torpedoplane or bomber it carries a crew of two, two machine guns and a torpedo or bombs weighing approximately 1,500 lb., as well as extensive equipment, including wireless and navigation lights, pyrotechnic signals, inflatable dinghy, etc.

CONSTRUCTION

Construction is entirely of metal with fabric covered wings and tail unit and the fuselage is built like a boat and designed to float in the event of forced descent into water.

ENGINE

Armstrong Siddeley " Tiger VI."

DIMENSIONS, WEIGHTS AND PERFORMANCE (Landplane with Torpedo)

DIMENSIONS

Landplane :

Span	46 ft.
Length	35 ft. 3 in.
Height	12 ft. 5 in.

WEIGHTS

Weight, unladen	4,119 lb.
Maximum loading :	
Fuel	1,178 lb.
Oil	81 lb.
Military load	2,773 lb.
Weight, loaded	8,111 lb.

PERFORMANCE

Top speed is 147·5 m.p.h. at 6,500 ft.
Range, 447 miles at 127 m.p.h.
With Armstrong Siddeley " Tiger VI " radial air-cooled engine giving 760 b.h.p. at 5,000 ft.

Oil consumption	8/12 pints per hour
Oil pressure	60/100 lb./sq. in.
Fuel consumption	Approx. 30 gal. per hour

AIRSPEED "ENVOY" SERIES III

DESCRIPTION

TYPE

A high performance commercial aeroplane. Makers : Airspeed (1937) Ltd., Portsmouth.

CONSTRUCTION

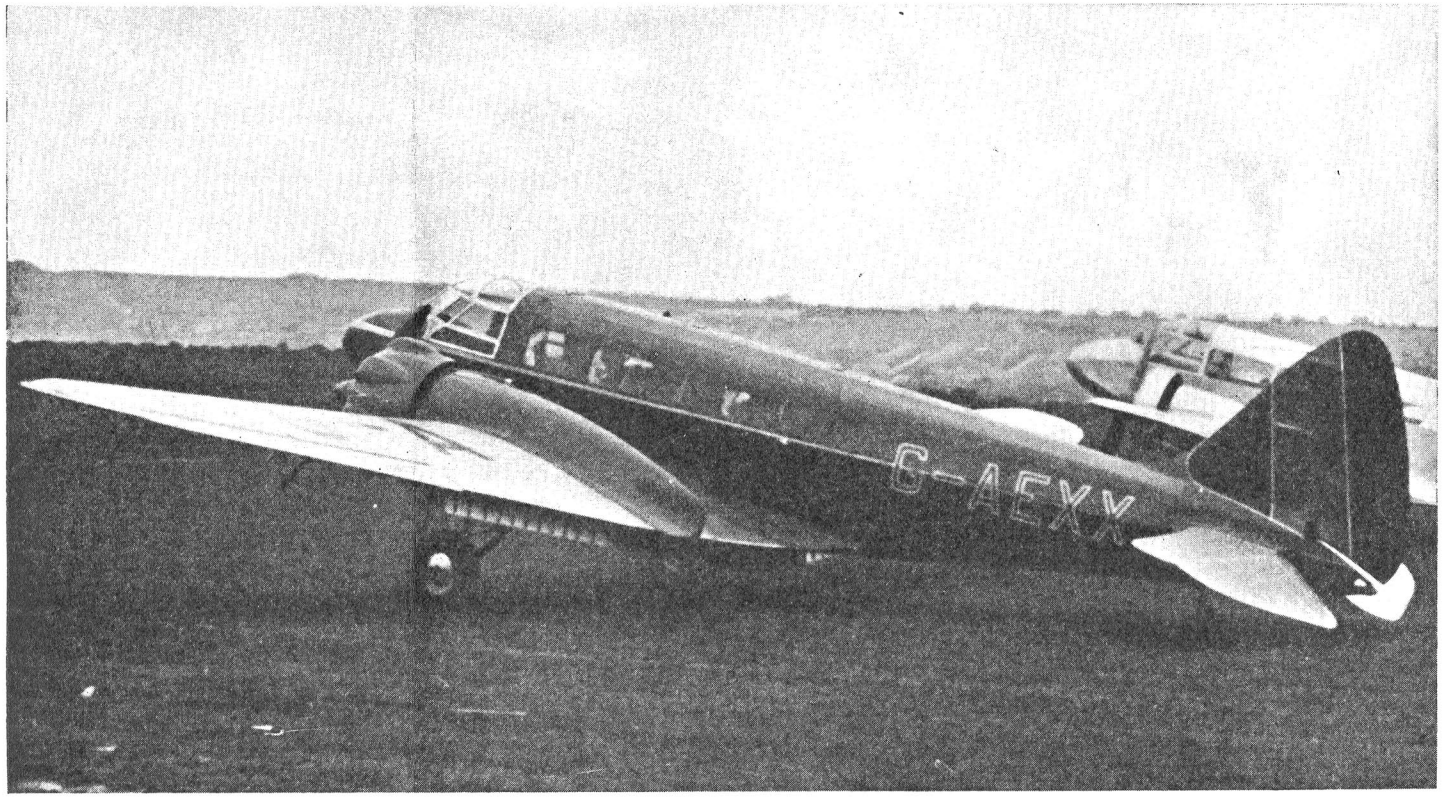
Twin engined, cantilever, low-wing monoplane, with stressed skin ply-covered wings, split trailing edge flaps extending from aileron to aileron, right under fuselage, and slotted ailerons.

ACCOMMODATION

Accommodation for pilot and six passengers with toilet compartment, or for eight passengers with no toilet. Luggage compartment separate, door port side.

POWER PLANT

Choice of power units from Armstrong Siddeley, Cheetah IX, Walter Castor II, Gnome Rhône 7 K.F.S. and 7 K.D., Wright Whirlwind R 760–E II, Jacobs L–S.



DIMENSIONS

Span	52 ft. 4 in.
Length	34 ft. 6 in.
Height	9 ft. 6 in.
Wing area	339 sq. ft.

PERFORMANCE

SPEED

Depending upon the engines installed, the maximum speed ranges from 185 to 226 m.p.h. and cruising speed from 167 to 204 m.p.h.

RANGE

Range with normal tanks, 650 miles ; with auxiliary tanks in extension planes, 1,000 miles.

FUEL CONSUMPTION

Various according to engine (see description for range)—from 25 to 32 galls. per hour.

WEIGHTS

WEIGHT UNLADEN

Varies according to engine, but average 4,000 lb.

MAXIMUM LOADING . . 6,500 lb.

Fuel (normal tanks 98 galls.)	816·2 lb.
Oil (11·5 galls.)	155 lb.
Crew (1)	170 lb.
Disposable Load	2,129 lbs. average

THE HANDLEY PAGE "HARROW"

TYPE

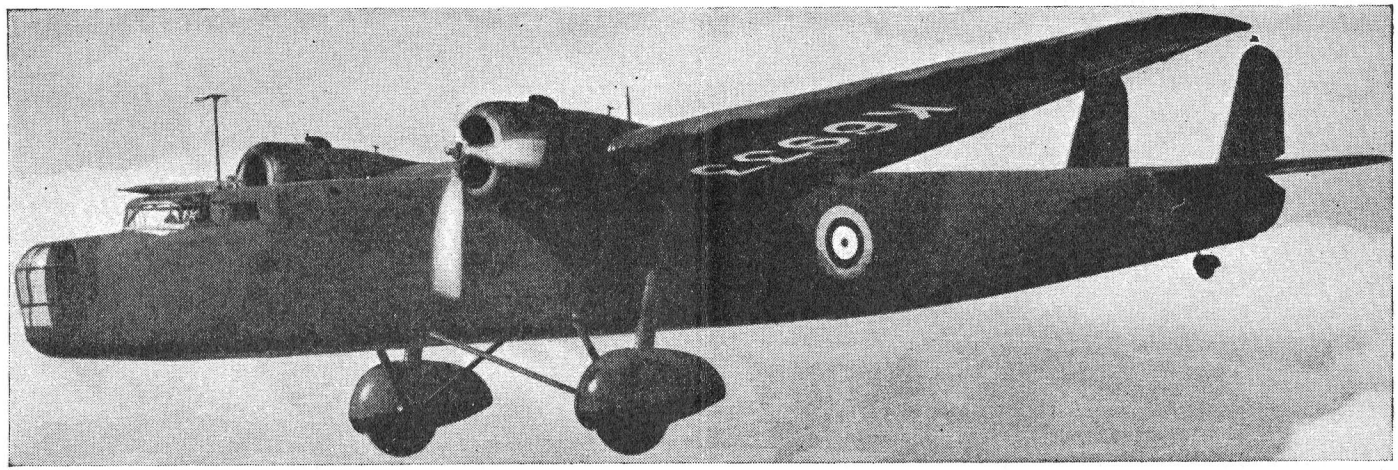
Twin-engined long-range night bomber.

POWER PLANT

Harrow I—two Bristol "Pegasus X" engines.

Harrow II—two Bristol "Pegasus XX" engines.

Fuel tanks in wing centre section and fuselage.



ARMAMENT

Three gun positions :—(*a*) In nose, (*b*) Top centre position just aft of wing, (*c*) In tail of fuselage.

Number of guns carried : One in nose, one in top centre position and two in tail position.

Bombs of various weights and sizes are accommodated in the fuselage.

WINGS

High-wing monoplane. Main plane tapered and constructed in three sections (two outer and one centre). Single spar, with nose ribs and alclad nose covering forward of spar forms torsionally stiff member of "D" section. Spar is built up of laminated duralumin flanges and tubular shear members, the whole forming an "N" type truss. Aft of spar, main plane section is completed by duralumin channel and tubular ribs. Outboard ends of the centre plane carry the engine mountings.

Automatic slots are fitted to outer planes for purpose of improving lateral stability at slow flying speeds. Slotted flaps are hinged along trailing portion of plane between ailerons and fuselage and are controlled by pilot through medium of hydraulic jacks. Due to installation of slotted flaps and wing tip slots, aeroplane possesses extremely wide speed range.

FUSELAGE

Tubular-braced structure. Longerons and majority of struts of steel. For front gun turret and large diameter struts of main cabin centre section hiduminium tubes are used. Main cabin is free from bracing and floor is supported on longitudinal and cross girders built up from duralumin channels and tubes. Walkway is provided throughout length.

TAIL PLANE

Monoplane type with twin fins and balanced rudders. Plane rigidly fixed to fuselage and trimming is obtained by a pilot-operated control actuating a vane inset in elevator. Tail plane is "bored" with alclad sheet skin stiffened by "Z" section stringers.

UNDERCARRIAGE

Of the fixed type in form of two tripods, each comprising oleo leg axle and radius rod. Wheel fairing is of special type designed to provide the minimum of air resistance. Pneumatic wheel brakes independently operated. Swivelling tail wheel.

ACCOMMODATION

Crew of 4/5 carried ; normally, pilot, second pilot, navigator, wireless operator. Additional to their normal duties, however, the following duties are also performed by this crew :—Operation of guns at front, centre and rear fuselage stations, and also operation of bomb release gear. Telephonic communication between all positions. Dual control can be installed alongside the pilot's seat, if required.

DIMENSIONS

Span	88 ft. 5·34 in.
Length overall	82 ft. 1·5 in.
Height, maximum, tail down	18 ft. 10 in.
Wing area	1,090 sq. ft.

WEIGHT

Total all-up weight, 23,000 lbs.

PERFORMANCE

With two Bristol "Pegasus X" engines :

Maximum speed at 8,000 ft	190 m.p.h.
Cruising speed at 15,000 ft.	157 m.p.h.
Range with normal bomb load	1,250 miles
Range (maximum)	1,880 miles

With two Bristol "Pegasus XX" engines :

Maximum speed at 10,000 ft.	200 m.p.h.
Cruising speed at 15,000 ft.	163 m.p.h.
Range with normal bomb load	1,250 miles
Range (maximum)	1,840 miles

HANDLEY PAGE "HAMPDEN"

GENERAL CATEGORY AND TYPE

Medium-size taper wing monoplane, designed as a bomber, which, in its class, it is claimed carries a greater load of bombs over a greater distance than any other type hitherto produced. It has internal bomb storage.

CONSTRUCTION

Stressed skin construction. Flush riveting all over.

EQUIPMENT

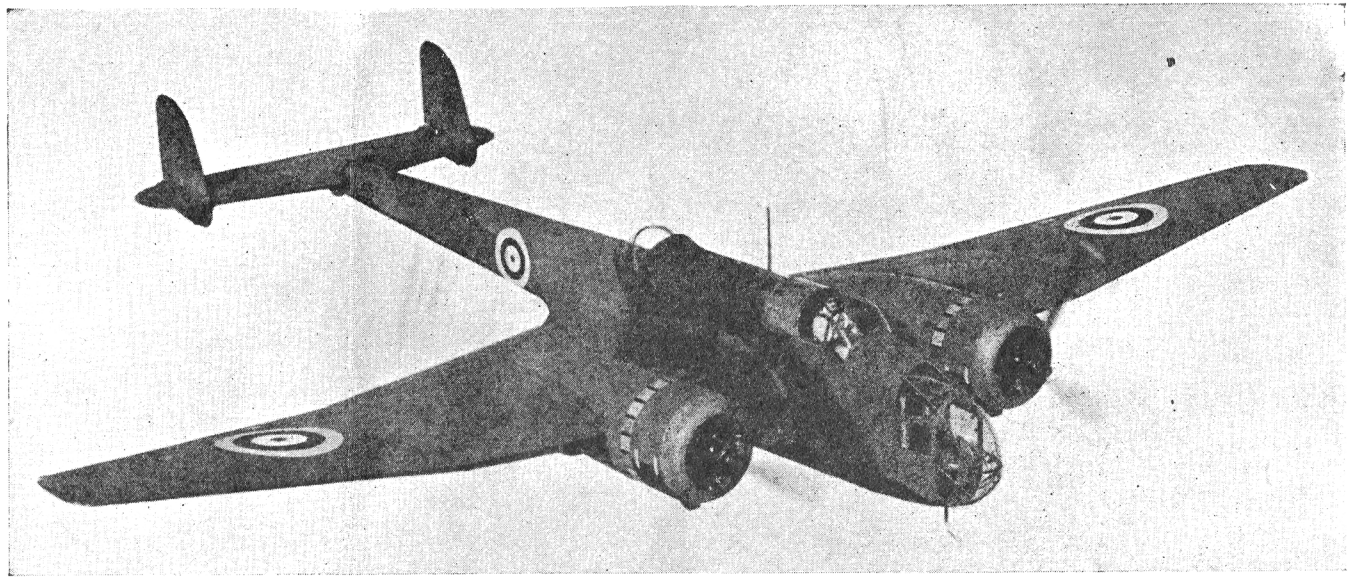
Retractable undercarriage and tail wheel. Twin rudders and fins. Variable pitch airscrews. Full defensive armament.

WINGS

Wings are of a marked taper and are set in about mid-position on the forward body. Slotted wing equipment enables the "Hampden" to be given a high wing loading together with low landing speed. In addition, the slotted wing flaps aid in enabling the aeroplane to lift a big load without demanding an unduly long take-off.

GENERAL DIMENSIONS & PERFORMANCE DATA

Fuselage dimensions :		
Maximum width	3·0 ft.	0·915 m.
Maximum height	8·7 ft.	2·65 m.
Maximum length	53·3 ft.	16·25 m.
Wing dimensions :		
Total area	668 sq. ft.	62·1 sq. m.
Mean aerodynamic chord	11·33 ft.	3·46 m.
Chord (root)	16·29 ft.	4·96 m.
Chord (tip)	3·85 ft.	1·17 m.
Aspect Ratio.	6·58	6·58
Tail plane span	21·17 ft.	6·45 m.
Weight data :		
Gross weight	18,750 lb.	8,525 kg.
Tare weight	11,780 lb.	5,354 kg.
Useful load	6,970 lb.	3,171 kg.
Distribution of useful load :		
Fuel	3,173 lb.	1,442 kg.
Oil	216 lb.	98 kg.
Crew (4, with 5 parachutes)	—	—
Service Load (including crew)	3,587 lb.	1,631 kg.
Engine data :		
Bristol Pegasus XVIII. / Napier Dagger VIII. / Rolls Royce Merlin X.	See maker's specifications.	



By courtesy of "The Aeroplane"

Fuel :		
Petrol—maximum	654 gal.	2,975 litres
Oil—maximum	36 gal.	164 litres
Landing gear track	17·25 ft.	5·26 m.

PERFORMANCE DATA WITH PEGASUS XVIII ENGINES

At normal flying weight of 18,750 lb. (8,525 kg.) :

Maximum speed at 15,500 ft. (4,730 m.)	265 m.p.h.	427 km/hr.
Cruising speed at normal r.p.m. at 15,000 ft. (4,580 m.)	217 m.p.h.	350 km/hr.
Economical cruising speed at 15,000 ft. (4,580 m.)	167 m.p.h.	269 km/hr.
Service ceiling	22,700 ft.	6,920 m.
Time to 15,000 ft. (4,580 m.)	18·9 min.	18·9 min.
Rate of climb at sea level	980 ft./min.	4·98 m/s.
Take-off run, clearing 50 ft. (15·2 m.) barrier	550 yds.	503 m.
Landing run, clearing 50 ft. (15·2 m.) barrier	550 yds.	503 m.
Landing speed	73 m.p.h.	117 km/hr.

Service load and range :

Load. lb.	Load. kg.	Range at normal cruising speed. miles	Range at normal cruising speed. km.	Range at economical cruising speed. miles	Range at economical cruising speed. km.
2,587	1,176	1,475	2,380	1,790	2,880
3,587	1,631	1,095	1,760	1,335	2,150
5,587	2,540	360	580	440	710

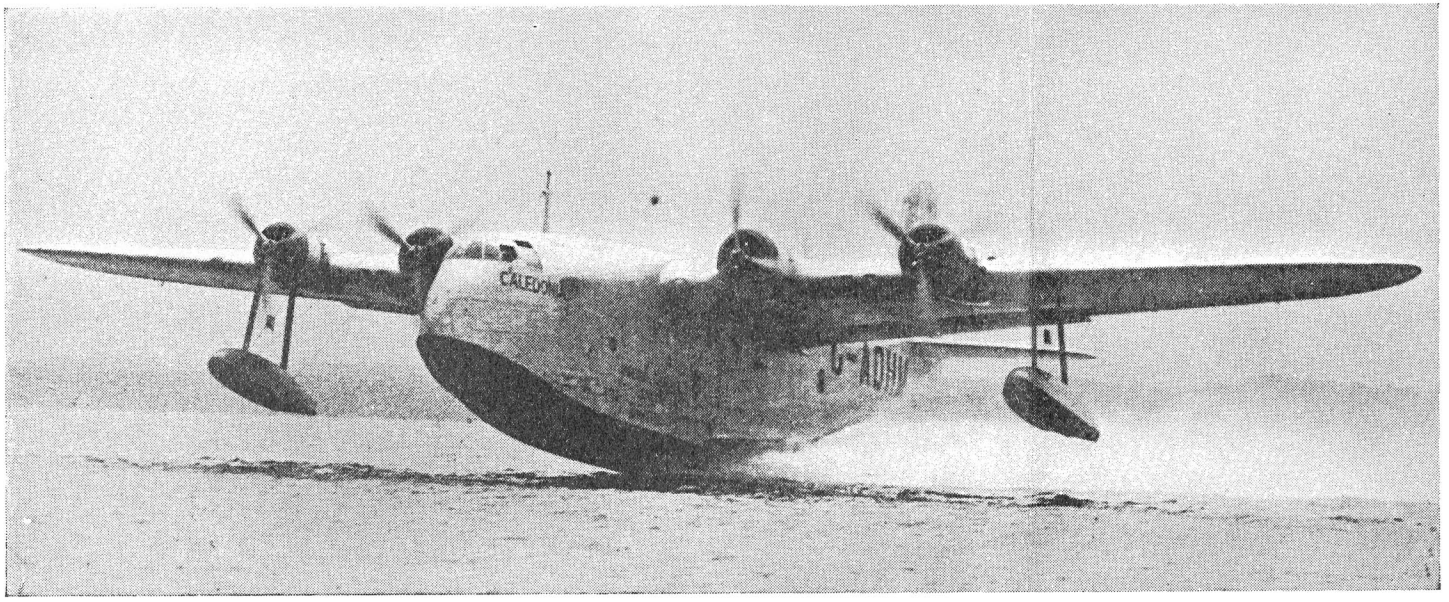
At maximum permissible flying weight of 21,000 lb. (9,550 kg.) :

Cruising speed at 15,000 ft. (4,580 m.)	212 m.p.h.	341 km/hr.
Economical speed at 15,000 ft. (4,580 m.)	172 m.p.h.	277 km/hr.
Service ceiling	19,500 ft.	5,950 m.
Time to 15,000 ft. (4,580 m.)	27·2 min.	27·2 min.
Rate of climb at sea level	760 ft./min.	3·87 m/s.
Take-off run, clearing 50 ft. (15·2 m.) barrier	810 yds.	741 m.

Service load and range :

Load. lb.	Load. kg.	Range at normal cruising speed. miles	Range at normal cruising speed. km.	Range at economical cruising speed. miles	Range at economical cruising speed. km.
3,587	1,631	1,725	2,780	1,990	3,210
5,587	2,540	1,165	1,875	1,340	2,160
6,587	2,994	788	1,270	870	1,400

EMPIRE FLYING BOATS



ENGINES (Standard Type)

Four Bristol Pegasus XC.

Max. take-off power	910 b.h.p. at 2,475 r.p.m.
Rated power	740 b.h.p. at 2,250 r.p.m. at 3,500 ft.
Max. power	790 b.h.p. at 2,600 r.p.m. at 5,500 ft.

ENGINES (Modified Type)

Four Bristol Perseus XIIC.

Max. take-off power	900 b.h.p.
Rated power	700 b.h.p. at 2,250 r.p.m. at 3,500 ft.
Max. power	800 b.h.p. at 2,600 r.p.m. at 5,500 ft.

TYPE

Unbraced, high wing monoplane with wing floats, made by Short Bros. (Rochester and Bedford) Ltd. Imperial Airways fleet of twenty-eight flying boats operating on Empire passenger and air mail routes. Two of these boats—"Caledonia" and "Cambria"—were fitted with special fuel tanks for the experimental flights across the Atlantic in 1937. A modified series of boats have been constructed to operate at considerably increased ranges, and two of this series have been provided with means to permit of refuelling in the air.

WIRELESS EQUIPMENT

Marconi equipment, retractable loop aerial and full direction finding equipment. The short and medium wave transmitter works on wavelengths of 16·9 to 75 metres and 600 to 1,100 metres. The output of the former is 100 watts and of the latter 120 watts with actual signal strengths of 30 and 60 watts respectively. The receiver works on 15 to 75 metres.

WINGS

All-metal stressed skin construction built on two main lift trusses of ordinary N-girder type and to take the drag and torsion loads by means of stressed skin between the two lift trusses. Lift trusses are formed by having extruded T-sections of hiduminium R.R.56 for flanges linked with vertical and diagonal tubular struts of R.R.56 alloy into which tongued fittings, machined from hiduminium, are fixed by tubular rivets. Stressed skin between top and bottom surface of the spars is stiffened on inside by Z-section stiffeners which run length of wing. Nose and trailing edges are similarly sheeted.

HULL

Monocoque construction, covered with alclad sheeting.

ACCOMMODATION

Two decks, upper deck accommodates crew of five (Captain, First Officer, Wireless Operator, Flight Clerk and Steward). Lower deck for seventeen passengers.

DIMENSIONS

Span	114 ft.
Length	88 ft.
Height overall to top of fin	31 ft. 9¾ ins.
Wing area	1,500 sq. ft.

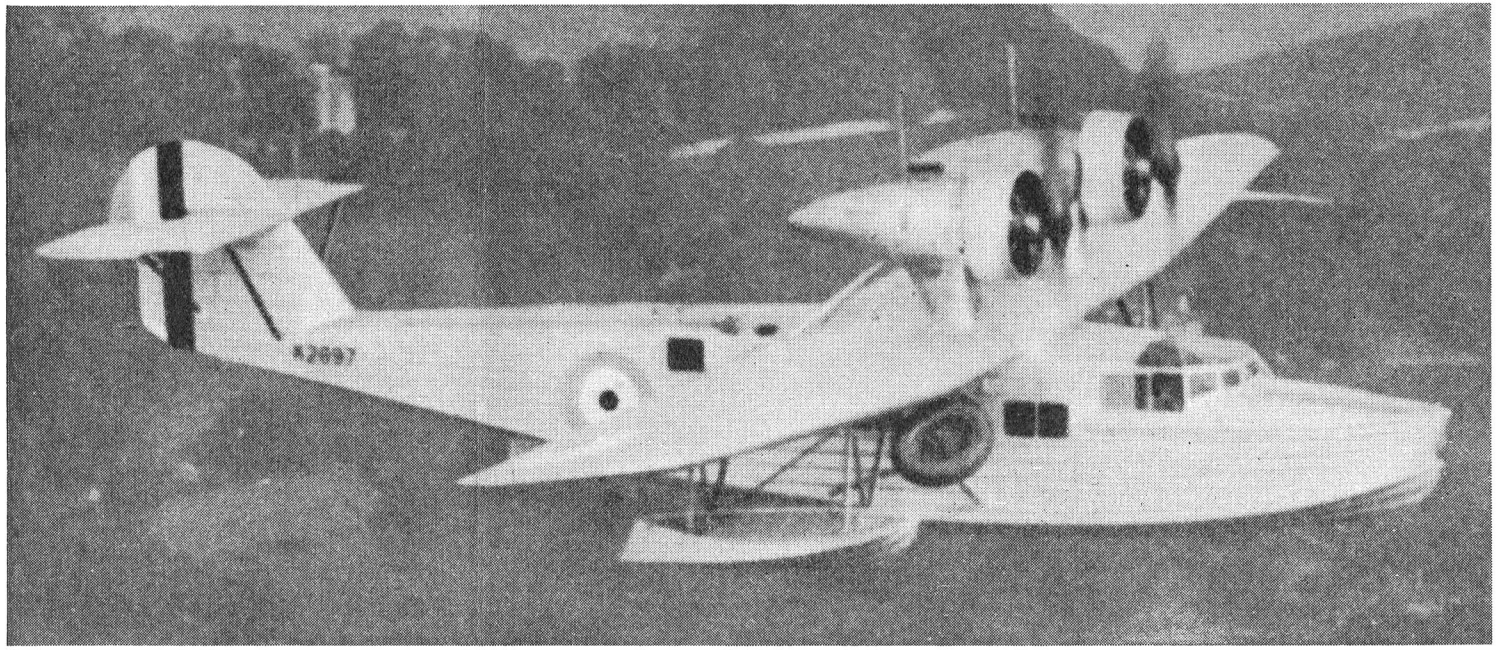
WEIGHTS

	Standard	Modified	Refuelled in Air
Weight, empty	24,820 lbs.	27,825 lbs.	27,180 lbs.
Fuel	4,470 lbs. (600 gals.)	10,500 lbs. (1,410 gals.)	18,100 lbs. (2,430 gals.)
Oil	400 lbs. (44 gals.)	810 lbs. (90 gals.)	1,530 lbs. (170 gals.)
Equipment	2,810 lbs.	2,615 lbs.	1,920 lbs.
Payload and Crew	8,000 lbs.	6,250 lbs.	4,270 lbs.
Weight loaded	40,500 lbs.	48,000 lbs.	53,000 lbs.

PERFORMANCE

	Standard	Modified	Refuelled in Air
Max. speed at 5,500 ft.	200 m.p.h.		
Max. economical cruising speed at 5,000 ft.	164 m.p.h.		
Minimum flying speed	73 m.p.h.		
Rate of climb at sea level (coarse pitch)	950 ft./min.		
Range in still air	810 miles	1,870 miles	3,400 miles
Time to take off	23 secs.		
Absolute ceiling	20,000 ft.		

SARO "CLOUD" AMPHIBIAN



TYPE

Twin-engined amphibian, made by Saunders-Roe, Ltd., East Cowes, Isle of Wight.

AMPHIBIAN CHASSIS

Special retractable gear, the axles and radius rods of which pick up the hull spar frames and the Oleo legs the front spar.

Operation of gear is by means of winch in pilot's cockpit. Lowering of wheels is instantaneous, while operation of raising takes approximately thirty seconds. Wheels can be used as a drogue, to reduce the speed of the aircraft through the water. Wheel brakes can be fitted as an extra.

HULL

Hull of "Alclad." All framing is of straight section and no plating has curvature in more than one direction. Four watertight bulkheads divide hull into five compartments. Moorings are picked up from opening in deck, which is covered with a sliding hatch.

ACCOMMODATION

Seating for two in control cabin. Seating for eight people in saloon cabin. Capacity for freight, 300 cub. ft. Luggage compartment capacity, 136 cub. ft. Lavatory aft.

FLOATS

Wing floats are of similar construction to hull and have two watertight bulkheads. They are attached to wing outboard of the amphibian undercarriage.

TAIL UNIT

Small trimming fin, tail plane, elevators and rudder of welded mild steel construction fabric covered. Tail plane attached to top of fixed fin. Elevator and rudder have horn balances.

Adjustment of tail plane incidence is by means of a screw jack operated by a handwheel in the pilot's cockpit.

WING

Conventional cantilever design of wooden construction.

Two spars of box section with spruce flanges and three-ply webs. Ribs of three-ply with spruce flanges. Covering of three-ply specially stiffened in the region of the engines to provide walkways. Wing is of sufficient buoyancy to support the aircraft if the hull should be damaged enough to cause it to be completely flooded. The wing attached to hull by four stainless steel fittings.

POWER UNIT

Two Armstrong-Siddeley Serval engines, air-cooled, static radial type having 10 cylinders, in two rows of 5 each (total 680 b.h.p.). They are mounted above the wings in a position which renders them easily accessible when on the water. Rear portion of engine enclosed in streamline nacelle.

Airscrew is geared, the ratio being ·657 to 1. Power developed at normal revs. of 2,000 is 340 h.p., and at maximum revs. of 2,200 the h.p. is 360.

DIMENSIONS

Length	49 ft. 9 in.
Span	64 ft.

AREAS

Wings	650 sq. ft.
Tail plane	89 sq. ft.
Fin and rudder	46 sq. ft.

WEIGHTS AND PERFORMANCE

(Fitted with two "Serval" engines—total 680 h.p.)

WEIGHTS	Flying Boat.		Amphibian.	
Tare weight	6,070 lbs.	2,752 kgs.	6,450 lbs.	2,928 kgs.
Total weight	9,500 ,,	4,310 ,,	9,500 ,,	4,310 ,,
Disposable load	3,430 ,,	1,558 ,,	3,050 ,,	1,382 ,,
The disposable load can be arranged as follows :—				
Fuel for 4 hours	1,100 ,,	500 ,,	1,100 ,,	500 ,,
Oil	140 ,,	63 ,,	140 ,,	63 ,,
Pilot	170 ,,	77 ,,	170 ,,	77 ,,
Eight passengers	1,360 ,,	617 ,,	1,360 ,,	617 ,,
Luggage	460 ,,	218 ,,	280 ,,	128 ,,

PERFORMANCE (± 5 per cent.)

Top speed at maximum r.p.m.	Flying Boat.		Amphibian.	
at sea level	120 m.p.h.	193 km. hr.	110 m.p.h.	177 km. hr.
Cruising speed	103 ,,	166 ,,	93 ,,	115 ,,
Climb	600 ft. min.	183 m. min.	500 ft. min.	152 m. min.
Ceiling	11,000 ft.	3,360 m.	10,000 ft.	3,050 m.

Water take-off 16 seconds.

Land take-off 200 yards (182 metres).

SARO LONDON II FLYING BOAT

TYPE

Twin-engined general purpose flying boat made by Saunders-Roe Ltd., East Cowes, Isle of Wight.

ENGINES

Two Bristol Pegasus X mounted on leading edge of the top plane which gives the airscrews a maximum water clearance.

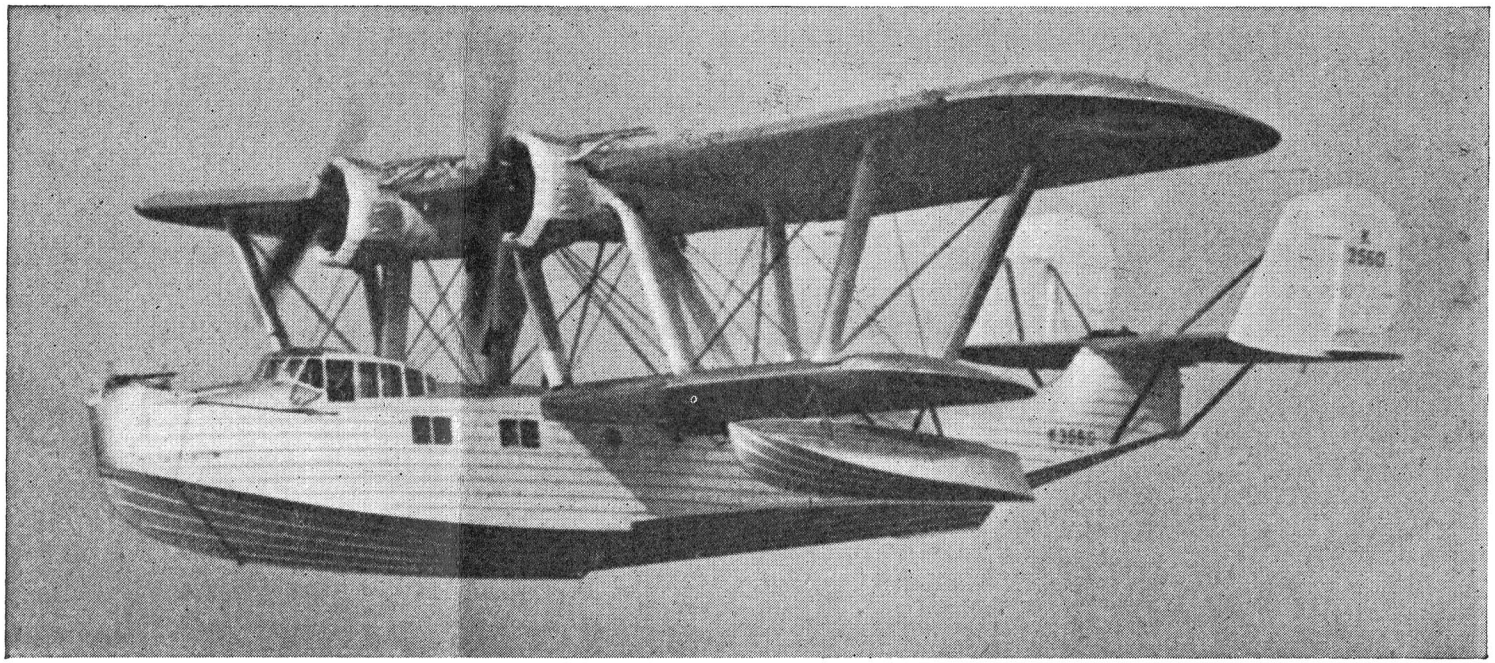
HULL

Usual two-step type with vee bottom. Straight-line frames are used, those in the rear portion, and the sides of those in the front part, being of "Z" section, and the rest of channel section. The planking is corrugated or fluted to avoid the use of riveted-on stringers. The hull is of alclad.

The arrangement of the rear step is of particular interest. It is of less beam than the main hull at that point, so that a fore and after stay is between the chine of the stay and the chine of the hull proper.

WINGS

The wing construction has spars formed from "locked joint" tube booms surrounded by "open" tubes having flanges for riveting to the flat sheet spar webs.



ACCOMMODATION

Provision is made for living on board, and comfortable bunks are provided in the compartments.

DEFENSIVE ARMAMENT

This includes three gunners' stations : one in the extreme bows, one in the extreme stern, and one aft of the wings. The bow compartment of the hull, in addition to marine gear, also contains the bomber's station.

FUEL TANKS

These are placed in the top centre-section leaving the entire hull available for accommodation.

PERFORMANCE (Bristol Pegasus X Engines)

Normal range	1,000 miles
Cruising speed	136 m.p.h.
Maximum speed at 6,560 ft.	155 m.p.h.
Service ceiling	19,900 ft.
Take-off time	16 seconds
Initial rate of climb	1,180 ft./min.
Over load range	1,600 miles

WEIGHTS

Bare weight	11,100 lb.
Normal fuel and oil load	4,300 lb.
Military load	3,456 lb.
Normal gross weight	18,930 lb.
Overload weight	22,000 lb.

WICKO CABIN MONOPLANE

TYPE

Two-seat cabin monoplane (fully aerobatic), made by the Foster, Wikner Aircraft Co. Ltd., Southampton Municipal Airport, Southampton.

WINGS

High-wing braced monoplane. Two-piece rectangular wing of Clark " YH " section, attached direct to the top fuselage longerons and braced by parallel struts to the lower longerons. Structure consists of two solid spruce spars, plywood girder ribs, the whole covered with plywood. Camber-changing flaps between ailerons and fuselage.

FUSELAGE

Rectangular spruce framework covered with plywood.

TAIL UNIT

Cantilever monoplane type. Spruce spars, girder ribs, plywood covering.

UNDERCARRIAGE

Cantilever type. Consists of two faired-in side vees with telescopic shock-absorbers. Wheel fairings. Bendix brakes, leaf-spring tailskid.

POWER PLANT

One 130-h.p. D.H. Gipsy Major Series I four-cylinder inline inverted air-cooled engine. Fuel capacity 30 gallons, oil capacity 2¼ gallons. Wooden airscrew.

ACCOMMODATION

Enclosed cabin seating two side-by-side. Dual controls.

PERFORMANCE

Maximum speed	140 m.p.h.
Cruising speed	120 m.p.h.
Landing speed	45 m.p.h.
Service ceiling	20,000 ft.
Cruising range	500 miles

SPECIFICATION

Span	31 ft. 6 in.
Length	23 ft. 3 in.
Height	6 ft. 1 in.
Wing area	155 sq. ft.
Power loading	15·3 lb./h.p.
Wing loading	13 lb./sq. ft.
Weight empty	1,255 lb.
Useful load	745 lb.
Payload	326 lb.
Gross weight	2,000 lb.
Baggage	150 lb.
Fuel	30 galls.
Oil	2¼ galls.

PERCIVAL "VEGA GULL" (Types K.1 and K.2)

TYPE

A high performance cabin monoplane made by Percival Aircraft Ltd., Luton Airport, Beds.

CONSTRUCTION

Single-engined 4-seater, low wing cabin monoplane. Fabric-covered wings, with reinforced leading edges. Long chord split trailing edge flaps. Folding wings.

ACCOMMODATION

Ample accommodation for four people and luggage. Seating arranged in two pairs with dual controls for the two front seats. One door each side.

Large luggage locker separate.

STANDARD EQUIPMENT

Metal airscrew, dual control, wheel brakes, pneumatic tail wheel, trailing edge flaps.

Boost gauge, compass, air-speed indicator, altimeter, revolution indicator, oil-pressure gauge, fuel contents gauge. Watch.

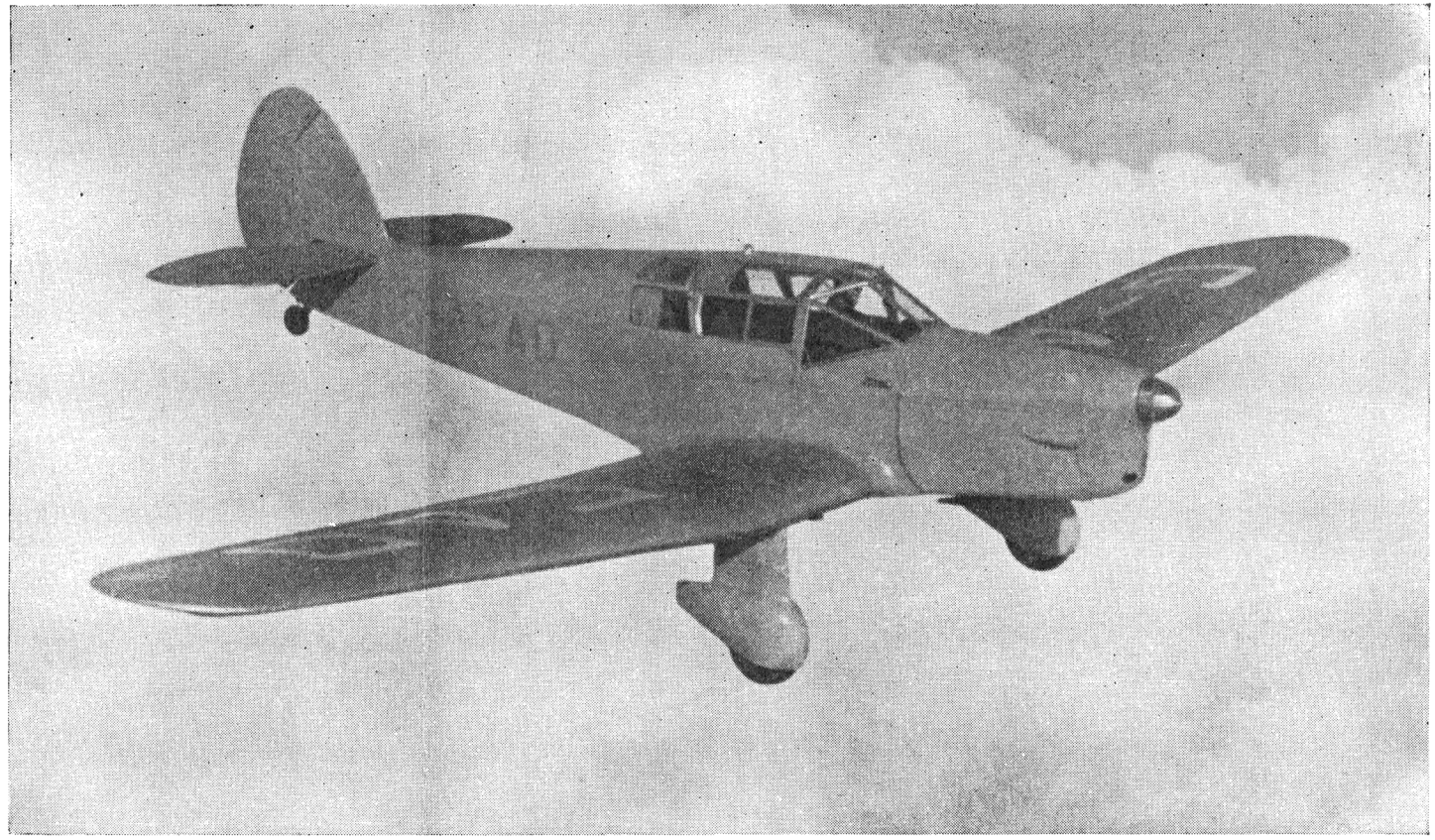
POWER PLANT

K.1. Gipsy VI Series I engine and fixed pitch airscrew.

K.2. Gipsy VI Series II engine and variable pitch airscrew.

DIMENSIONS

Length	25 ft. 4 in.
Span	39 ft. 6 in.
Span (folded)	16 ft.
Height	7 ft. 4½ in.



"VEGA GULL" Type K.1

(Gipsy VI Series I and fixed pitch airscrew)

WEIGHTS

Weight, empty	1,660 lbs.
,, loaded	3,000 lbs.
Pay load in addition to pilot, standard tankage and full equipment	832 lbs.

PERFORMANCE

Maximum speed	173 m.p.h.
Cruising speed	150 m.p.h.
Range, with standard tankage	630 miles

"VEGA GULL" Type K.2

(Gipsy VI Series II and variable pitch airscrew)

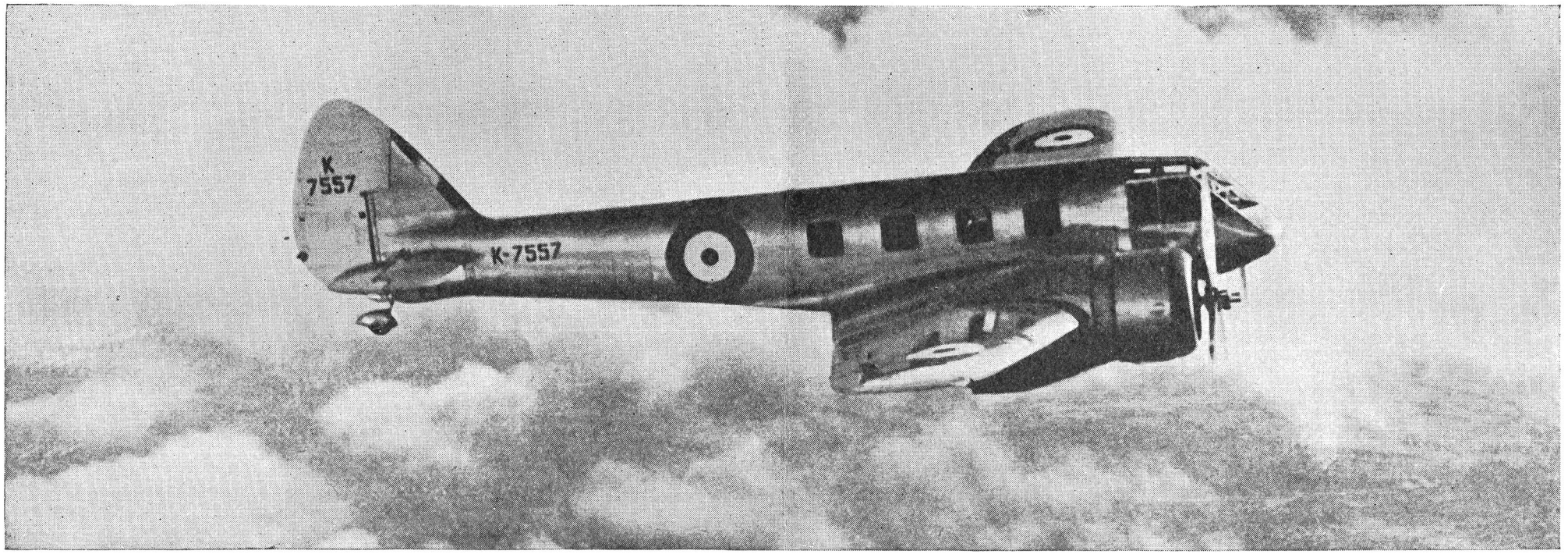
WEIGHTS

Weight, empty	1,740 lbs.
,, loaded	3,250 lbs.
Pay load in addition to pilot, standard tankage and full equipment	1,002 lbs.

PERFORMANCE

Maximum speed	175 m.p.h.
Cruising speed (at 7,000 feet)	170 m.p.h.
,, ,, (at sea level)	160 m.p.h.
Range, with standard tankage	660 miles
Range, with extra tanks	1,100 miles

BRISTOL TYPE 142 ("BRITAIN FIRST")



GENERAL CATEGORY AND TYPE

Twin-engined commercial aeroplane.

This aeroplane was originally designed as a commercial type with "Bristol" sleeve-valve engines, but was modified and fitted with "Bristol" Mercury engines, which made it the fastest aeroplane of its kind in the world.

ENGINES

Two "Bristol" Mercury engines, VIs 645 h.p. each, at 15,000 feet.

ACCOMMODATION

Originally designed as a ten-seater (pilot and navigator and eight passengers). Actually this particular aeroplane is a six-seater, the pilot's compartment being in the nose, with two seats for two pilots with dual controls.

OVERALL DIMENSIONS

Length	39 ft. 10 in.
Span	56 ft.
Height	12 ft. 2 in.

UNDERCARRIAGE

Retractable, hydraulically-operated, fitted with hydraulic brakes.

AILERONS

"Bristol-Frise" ailerons; massed-balanced. Split trailing-edge flaps.

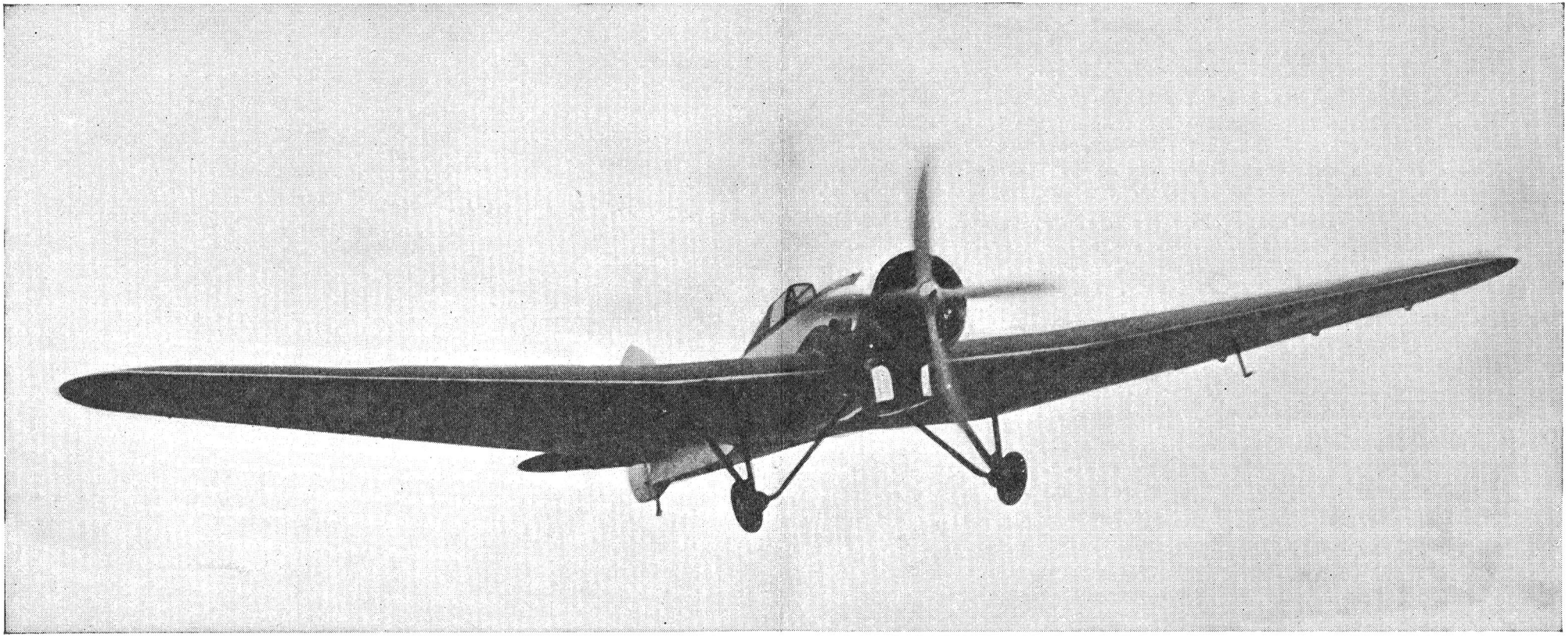
WINGS

Low-wing all-metal stressed-skin monoplane, designed for high-speed transport of passengers, freight or mail.

FUSELAGE, Etc.

Monocoque construction. Body, wings, tail plane and fin are all entirely of metal construction with metal covering.

"BRISTOL" TYPE 138A



GENERAL CATEGORY AND TYPE

High altitude monoplane made by Bristol Aeroplane Co., Ltd. This aeroplane has twice gained the world altitude record for Great Britain.

TYPE OF ENGINE

Radial air-cooled.
"Bristol" Pegasus special.

ACCOMMODATION

Single-seater.

OVERALL DIMENSIONS

Span	66 ft.
Length	44 ft.
Height	10 ft. 3 in.

UNDERCARRIAGE

Fixed type—divided axle.

AILERONS

Balanced "Bristol-Frise" type.

WINGS

Low-wing; wood construction and plywood covering.

PERCIVAL "MEW GULL"

TYPE

The "Mew Gull" is a single-seat cabin monoplane of high performance, made by Percival Aircraft Ltd., Luton. It was the first British civil aeroplane to have a top speed of more than 200 miles an hour.

PURPOSE

Its purposes, among other things, are high-speed touring, mail feeder service, and high-speed trainer.

The aeroplane can be flown by any average pilot, and important qualities such as reasonable landing speed, good take-off and general ease of handling have not been sacrificed in achieving this outstandingly high performance.

WINGS

The "Mew Gull" is fitted as standard with Split Trailing Edge Flaps, and was the first commercial aeroplane in Great Britain to make use of this most important feature.

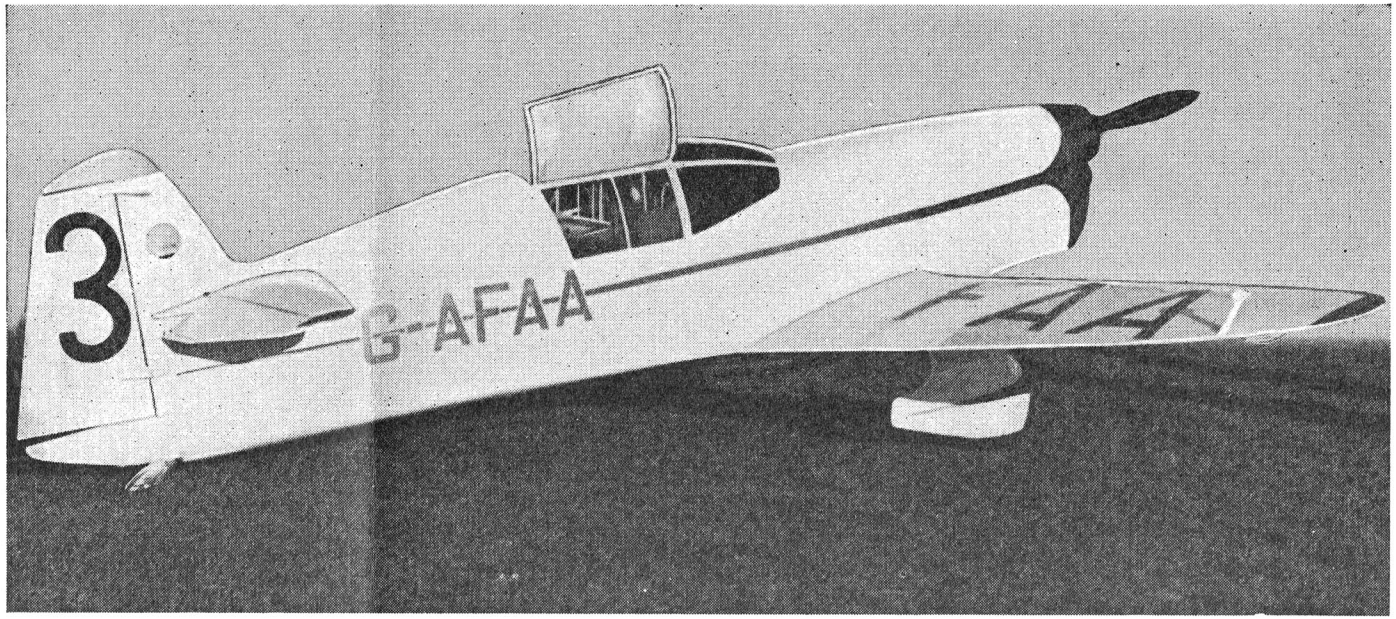
RANGE

The range is approximately 750 miles, but may be increased as follows :

E2H up to 1,500 miles at 220 m.p.h.
E3H up to 1,350 miles at 230 m.p.h.

ENGINE

The aeroplane is fitted as standard with a Gipsy VI Series II engine of 205 horse-power.



PERFORMANCE

	Type E3H Gipsy Six Series II Engine and V.P. Airscrew	Type E2H Gipsy Six Series II Engine and V.P. Airscrew
Maximum speed	250 m.p.h.	235 m.p.h.
Cruising speed at 7,000 ft.	235 m.p.h.	226 m.p.h.
Cruising speed at sea level	220 m.p.h.	205 m.p.h.
Take-off run	180 yards	180 yards
Landing run	180 yards	180 yards
Landing speed	63 m.p.h.	60 m.p.h.
Rate of climb at sea level	1,800 ft./min.	1,700 ft./min.
Standard tankage	38 gall.	38 gall.
Fuel consumption (cruising)	9/10 gall. per hr.	9/10 gall. per hr.

WEIGHTS AND DIMENSIONS

	E2H Gipsy Six Series II Engine and V.P. Airscrew	E3H Gipsy Six Series II Engine and V.P. Airscrew
Pay load, in addition to pilot	483 lbs. for 860 miles	205 lbs. for 900 miles
Weight, empty	1,150 lbs.	1,150 lbs.
Weight, loaded.	2,125 lbs.	1,850 lbs.
Length	20 ft. 3 ins.	20 ft. 3 ins.
Wing span	24 ft. 9 ins.	22 ft. 9 ins.
Height	6 ft. 10 ins.	6 ft. 10 ins.

BRITISH AIRCRAFT "EAGLE"

TYPE

The B.A. " Eagle " is a three-seater, full Cantilever, low-wing, cabin monoplane, and has been designed to meet the requirements of the Private owner, Air line or Taxi-service operator. It is made by the British Aircraft Manufacturing Co. Ltd., Hanworth Aerodrome, Feltham, Middlesex.

CONSTRUCTION

The construction is of wood, plywood covered (except the elevator and rudder, which are covered in fabric), the engine bearers and part of the cabin being reinforced with steel tube. The cabin portion is built with a split top longeron which allows the whole of the centre top half of the cabin to open in two halves, affording unrestricted access and exit on either side. This is one of the exclusive features of the B.A. " Eagle."

ACCOMMODATION

The cabin is luxuriously upholstered in real leather, and ample leg and head room is provided. The seating arrangement allows for the maximum comfort of both pilot and passengers. Extensive front and side windows give good visibility in all directions.

Luggage space for three suitcases (11 cubic ft.) is situated behind the passengers' seats and above this compartment is a convenient ledge for light articles. Dual flying control is fitted, the rear rudder bar and control column being detachable.

UNDERCARRIAGE

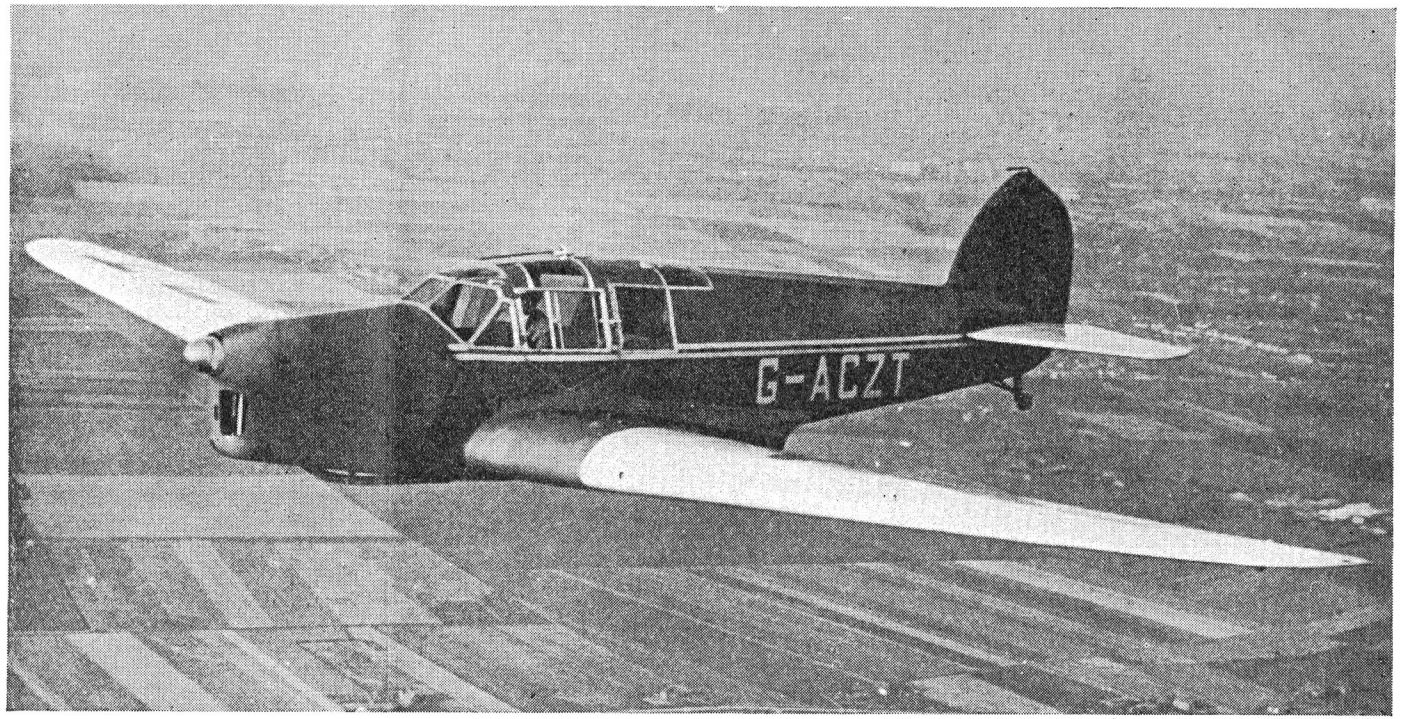
The retractable undercarriage is the Company's own design. It is fool-proof and self-locking. The arrangement for raising and lowering is by means of a handle geared to the winding mechanism which is inter-connected with the throttle control, ensuring that the pilot cannot fully throttle back to land unless he has previously wound down the undercarriage. There is also an indicator by the throttle control which shows the safe position.

WHEELS

The wheels are held in the up position by an automatic safety catch, which is released by pressing a small foot pedal. The time taken to raise is under 10 seconds, whilst lowering is considerably less.

WINGS AND TAILPLANE

The tailplane is adjustable in the air, and is of sufficient range to allow the aeroplane to be trimmed for level flight with all loads at any desired engine setting. The wing folding is effected in a very simple manner, and this operation can be carried out single-handed, without the use of any tools. Two fuel tanks, with a total capacity of 40 gallons, are installed, one in each wing stub, and fuel is fed by dual A.C. pumps driven by the engine.



SPECIFICATION

B.A. " EAGLE " THREE-SEATER CABIN WITH RETRACTABLE UNDERCARRIAGE

ENGINE (130 h.p. Gipsy Major)

Wing area	200 sq. ft.
Span overall	39 ft. 3 in.
Span, wings folded	14 ft. 10 in.
Chord maximum	6 ft. 6½ in.
Chord aerodynamic	5 ft. 9 in.
Aspect ratio	7·75
Length overall	26 ft.
Height	6 ft. 9 in.
Wheel track	6 ft. 3 in.
Wheels	Dunlop Disc
Tyres	Interm. Low Press. 7·25 × 7¾
Brakes	Dunlop

WEIGHTS

Tare weight, including all standard fixed equipment	1,450 lbs.
Pilot	160 lbs.
Fuel, 36 galls. (162 litres)	277 lbs.

WEIGHTS—*continued.*

Oil, 2¼ galls. (10 litres)	22 lbs.
Payload (passengers and luggage or freight)	491 lbs.
Weight loaded	2,400 lbs.

PERFORMANCE AT FULL LOAD

ENGINE (130 h.p. Gipsy Major)

Maximum speed	150 m.p.h.
Cruising speed	130 m.p.h.
Landing speed	45 m.p.h.
Take-off, solo	105 yards
Take-off, with full load	195 yards
Initial rate of climb	700 ft. per min.
Ceiling	16,000 ft.
Fuel consumption	7 galls. p.h.
Flight duration	5 hours
Range	650 miles

STANDARD EQUIPMENT

Dual control, engine revolution indicator, air speed indicator, Reid and Sigrist turn and bank indicator, altimeter, fore and aft level, oil pressure gauge, oil temperature gauge, electric fuel gauge, compass, 8-day clock, wired for navigation lights. Fire extinguisher, tool kit, real leather upholstery, carpet and roomy luggage compartment.

MONOSPAR "UNIVERSAL"

DESCRIPTION

TYPE

Four seat twin-engined cabin monoplane, made by General Aircraft Ltd., London Air Park, Feltham, Middlesex.

CONSTRUCTION

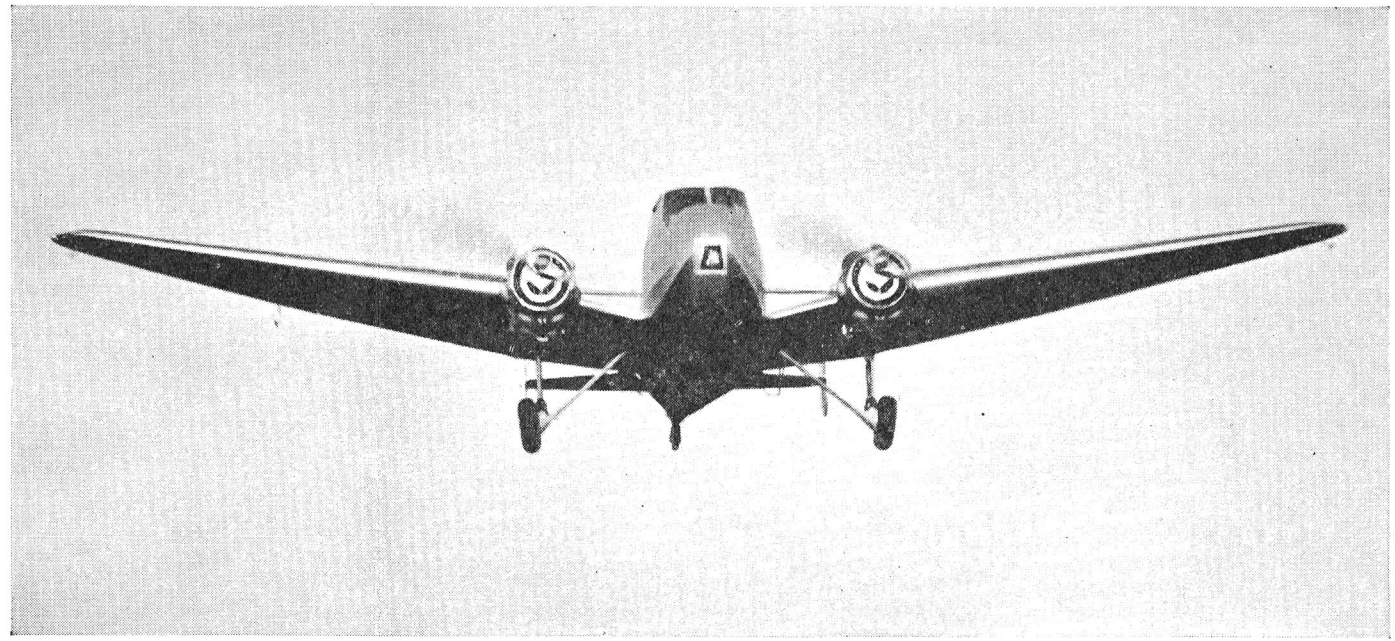
Low-wing cantilever monoplane, tapering in chord and thickness outwards from engines. Metal construction, built under the Monospar system. Fabric covered throughout. The wings fold.

ACCOMMODATION

The cabin is arranged to provide easy conversion from passenger to freighter or ambulance. Pilot and front passenger are accommodated forward of the spar on separate side-by-side seats, with the second pair of passengers immediately behind. Aft of the seats is a large luggage platform 4 ft. × 3 ft.

POWER PLANT

Two 95 h.p. Pobjoy Niagara III seven-cylinder radial air-cooled geared engines. Fuel tank (40 gallons) in cabin, beneath front seats. Oil tanks in engine nacelles. Electric engine starters.



DIMENSIONS

Span	40 ft. 2 in.
Length	25 ft. 4 in.
Height	7 ft. 10 in.
Span (wing folded)	14 ft. 11 in.
Wing area	217 sq. ft.

PERFORMANCE

Speed : Maximum	131 m.p.h.
Cruising	115 m.p.h.
Range	419 miles
Fuel consumption	5½ gallons per hour per engine

WEIGHTS AND LOADINGS

Weight empty	1,818 lbs.
Pilot and three passengers and baggage	721 lbs.
Weight of fuel and oil	336 lbs.
Weight fully loaded	2,875 lbs.
Power loading	15·1 lbs./h.p.
Wing loading	13·25 lbs./sq. ft.

BRITISH AIRCRAFT SWALLOW

TYPE

Full cantilever, low-wing monoplane, made by British Aircraft Manufacturing Co. Ltd., Hanworth Aerodrome, Feltham, Middlesex.

CONSTRUCTION

Wood, all plywood covered, except elevator and rudder, which are covered in fabric.

Dual control, two seats tandem.

Folding wings, easily operated single-handed without the use of any tools.

Special low-resistance undercarriage, cantilever type, with wide track and specially designed shock absorbers.

Brakes, operating independently on each wheel, and can also be used for parking.

Cantilever tail plane, adjustable on ground.

Luggage locker behind pilot.

STANDARD EQUIPMENT

Dual control, compass, fuel gauges (2), oil pressure gauge, engine revolution indicator, air speed indicator, altimeter, cross level.

Real leather upholstery, luggage compartment, map case, speaking tubes, tool kit.

SPECIFICATION

	British	Metric
Wing area	215 sq. ft.	20 sq. m.
Span overall	42 ft. 8½ in.	13 m.
Span, wings folded	15 ft. 1 in.	4·6 m.
Chord maximum	6 ft. 6½ in.	2·0 m.
Chord aerodynamic	5 ft. 5 in.	1·66 m.
Aspect ratio	8·45	8·45
Length overall	27 ft.	8·2 m.
Height	7 ft.	2·14 m.
Ground angle	13°	13°
Wheel track	6 ft. 3 in.	1·90 m.
Wheels	Dunlop Disc.	Dunlop Disc
Tyres	Interm. Low Press. 20 × 6·84	Interm. Low Press. 500 × 180
Brakes	Bendix	Bendix
Airscrew	Wood	Wood

PERFORMANCE

	POBJOY CATARACT III 90 H.P.		CIRRUS MINOR 90 H.P.	
	British	Metric	British	Metric
Maximum speed	104 m.p.h.	166 km.p.h.	104 m.p.h.	166 km.p.h.
Cruising speed	92 m.p.h.	147 km.p.h.	92 m.p.h.	147 km.p.h.
Landing speed	25–30 m.p.h.	40–48 km.p.h.	25–30 m.p.h.	40–48 km.p.h.
Take-off, solo	40 yards	36·5 m.	45 yards	41·25 m.
Take-off, full load	50 yards	46 m.	55 yards	50·5 m.
Rate of climb	800 ft. per min.	244 m. per min.	700 ft. per min.	235 m. per min.
Gliding angle	1 in 12	1 in 12	1 in 12	1 in 12
Ceiling	17,000 ft.	5,150 m.	16,500 ft.	5,040 m.
Fuel consumption	5 gals. per hr.	22·5 litres per hr.	3½ gals. per hr.	16 litres per hr.
Flight duration	3·8 hrs.	3·8 hrs.	4·2 hrs.	4·2 hrs.
Range	355 miles	570 km.	390 miles	625 km.

WEIGHTS

	POBJOY CATARACT III 90 H.P.		CIRRUS MINOR 90 H.P.	
	British	Metric	British	Metric
Weight empty, including all standard fixed equipment	990 lbs.	450 kg.	1,030 lbs.	468 kg.
Pilot	160 lbs.	73 kg.	160 lbs.	73 kg.
Fuel	19¼ gals.	87 litres	14¾ gals.	67 litres
	147 lbs.	67 kg.	113 lbs.	51 kg.
Oil	2½ gals.	11·5 litres	1½ gals.	7 litres
Pay load (passenger and luggage or freight)	180 lbs.	81·5 kg.	180 lbs.	83 kg.
Weight loaded	1,500 lbs.	682 kg.	1,500 lbs.	682 kg.

SHORT-MAYO COMPOSITE AIRCRAFT

The purpose of the Short-Mayo composite aircraft is to overcome the difficulty of launching long-range aeroplanes into the air with the requisite load of fuel. The composite aircraft solves this problem by "transporting" the long-range aeroplane into the air by means of an auxiliary aeroplane to which the long-range aeroplane is rigidly attached. At a suitable height the long-range aeroplane is released from the auxiliary, rises clear and proceeds on its flight.

The lower component or auxiliary is a four-engined flying-boat similar in size to the "Empire" flying-boat, and could be used for normal operations if required.

LOWER COMPONENT

TYPE

Four-engined flying-boat similar in general arrangement and construction to the Short "Empire" type flying-boat.

WINGS

High wing-cantilever monoplane. Similar in construction to those of "Empire" flying-boat, but are larger in area. Gouge type dragless flaps are fitted. Support points for the floats of the upper component are provided at the wing roots.

HULL

Generally similar to the Short "Empire" flying-boat in design and construction, but with slightly different internal arrangement. On top of the hull are carried two pylons of steel tube connected by a cross beam to support the central keel of the upper component, in which is located the release mechanism. The whole of the interconnecting structure is readily detachable, leaving a smooth finish to the hull and wings.

TAIL UNIT

Of general similar form to the Short "Empire" flying-boat.

POWER PLANT

Four Bristol "Pegasus X" nine-cylinder radial air-cooled engines, each giving a maximum output of 875–915 h.p. at 2,600 r.p.m. at 6,250 ft. (1,906 m.), a normal output of 810–850 h.p. at 2,250 r.p.m. at 4,000 ft. (1,220 m.) and a take-off output of 920–960 h.p. at 2,475 r.p.m. N.A.C.A. type cowlings with controllable flaps. De Havilland three-bladed controllable-pitch airscrews.

ACCOMMODATION

Two-deck accommodation as in the Short "Empire" boat. In the extreme nose is the mooring compartment, aft of which is a small stowage. A lavatory on the port side and the pantry on the starboard side follow. Next is the forward passenger compartment with seats for six. Between the spar frames is the midship cabin with seats for four passengers, and aft of the rear spar is the rear cabin for eight passengers. Further aft is another lavatory and a luggage compartment, from which access is available to the bunk stowage on the upper deck. On the upper deck is the pilot's compartment, aft of which is the wireless cabin. Then there is a mail compartment and stowage for bunks and bedding. As a solo aeroplane the lower component carries a load of passengers, baggage and mails corresponding to the Short "Empire" boat (*e.g.*, twenty-four passengers, etc.). For night flying sleeping accommodation may be provided for sixteen passengers. The cabins are decorated and furnished to the same luxurious standard as the Short "Empire" boats.

DIMENSIONS

Span, 114 ft. (34·77 m.); length, 84 ft. 10⅜ in. (25·89 m.); height, (to top of fin), 32 ft. 7½ in. (9·95 m.); wing area, 1,750 sq. ft. (162·5 sq. m.).

["*The Aeroplane.*"

UPPER COMPONENT

TYPE

Four-engined float seaplane.

POWER PLANT

Four Napier-Halford "Rapier" Mk. V sixteen-cylinder "H" type air-cooled engines, each giving a maximum output of 340 h.p. at 4,000 r.p.m. at 13,000 ft. (3,965 m.) and a normal output of 315 h.p. at 3,500 r.p.m. at 10,000 ft. (3,050 m.). Two-bladed wooden airscrews. Fuel tank (1,200 Imp. gals.) in main spar of wing.

WINGS

High-wing cantilever monoplane. All-metal structure with the exception of the ailerons which are covered with fabric. Main spar is a built-up girder with booms of hiduminium extruded sections. Into the spar is built a fuel tank of 1,200 gals. capacity. Wing covering is of smooth metal sheet with joggled lap joints and countersunk riveting.

FUSELAGE

Metal monocoque built on a heavy centre keelson, in which are incorporated the points for the main support cradle. The release mechanism is fitted in this central keel, this being the only positive attachment between the two aeroplanes. Lateral stability is provided by supports under each float. Smooth metal covering with joggled lap joints and flush riveting.

TAIL UNIT

Cantilever monoplane type. Duralumin framework with built-up spars. Fin and tailplane covered with smooth metal sheet, rudder and elevators covered with fabric.

UNDERCARRIAGE

Short all-metal twin-float chassis of normal type; flotation based on landing condition after consumption of heavy load of fuel.

ACCOMMODATION

Pilot's compartment in front of leading-edge of wings. Immediately aft of pilot is the wireless operator. From the wireless compartment a gangway runs aft beneath the main spar to the lavatory and mail compartment. Nose of the fuselage is hinged to facilitate inspection and maintenance of controls.

DIMENSIONS

Span, 73 ft. (22·26 m.); length, 50 ft. 11⅛ in. (15·55 m.); height (to top of fin), 20 ft. 3 in. (6·176 m.); float track, 14 ft. 6 in. (4·42 m.); wing area, 611 sq. ft. (56·76 sq. m.).

WEIGHTS AND PERFORMANCE

When carrying a load of 1,000 lb. of mail it is calculated that the aeroplane will have a range of approximately 3,800 miles at a cruising speed of 170–180 m.p.h. The elimination of the "take-off" problem by the composite aircraft method enables this performance to be achieved with the very low total of 1,280 h.p. The normal total weight of this component is 20,000 lb. of which nearly one-half represents fuel and oil. It should be noted that the aeroplane would be quite incapable of taking off by itself at a total weight approaching 20,500 lb.

ARMSTRONG WHITWORTH (A.W.27)

TYPE

Four-engined passenger air-liner designed to operate on the Imperial Airways European and Empire routes.

WINGS

High-wing cantilever monoplane, tapering in plan-form and thickness, built on a single box-spar of corrugated light alloy sheet. The leading edge is metal-covered, and part of it is used as cooling oil tanks. Aft of the spar the wing consists of a lattice structure of Armstrong-Whitworth rolled sections of light alloy, fabric covered, and fitted with split trailing edge flaps extending between ailerons and fuselage, which greatly reduce the landing speed.

The metal frame fabric-covered Frise ailerons are mass-balanced. A tab on the port aileron can be operated from the cockpit for trimming the aircraft laterally.

FUSELAGE

Oval monocoque structure of light alloy, built of transverse frames, longitudinal stringers and smooth flush-riveted stress-bearing skin.

TAIL UNIT

The monoplane cantilever tail plane, which is carried on a single box-spar of corrugated light-alloy sheet of similar construction to that used in the main planes, is fabric covered. It is not adjustable, fore and aft trim being effected by elevator tabs.

The elevators are not aerodynamically balanced, but the elevator controls inside the fuselage are provided with spring-loaded balances of rubber shock-absorber cord.

A single-cantilever fin and one rudder, both metal-framed and fabric covered, are well faired into the fuselage. As on the other control surfaces, the rudder has an automatic servo-flap which is also fitted with controls for trimming.

UNDERCARRIAGE

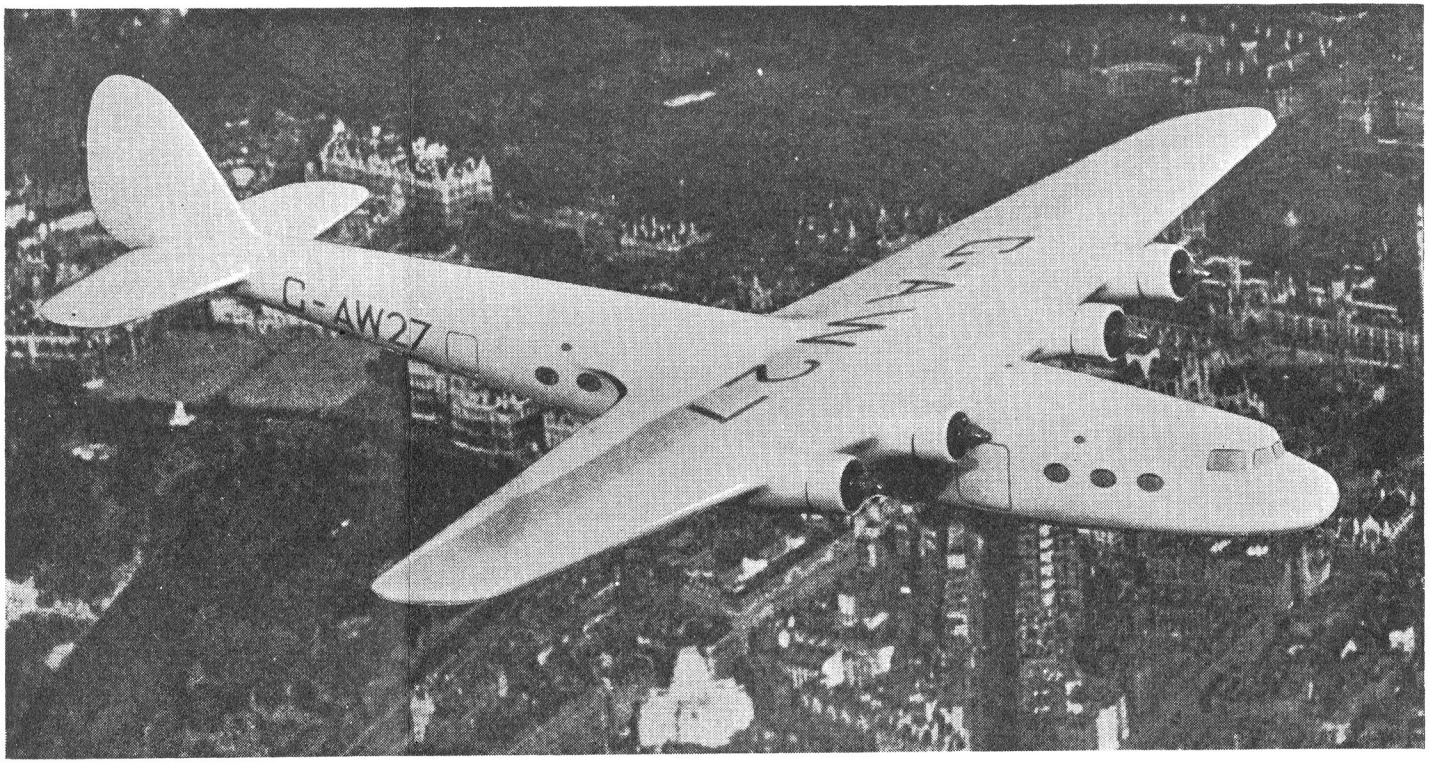
Retractable units under the inner engine nacelles, each consisting of one Dunlop wheel and tyre 75·6 in. diameter by 26 in. wide, and two steel-spring and oleo shock absorber struts. Reaction is hydraulically operated by folding the rear strut of each unit. The wheels travel backwards and upwards into the engine fairings and behind the main plane spars. The Dunlop pneumatic brakes are differentially controlled through the rudder pedals.

Fully castoring tail-wheel carried on a steel-spring and oleo leg, which is controlled by a self-centring cam.

POWER PLANT

Four moderately supercharged Armstrong Siddeley Tiger IX engines, in nacelles attached to the forward side of the main plane spar by Armstrong Siddeley patented flexible mountings of welded steel tubes. The use of rubber pads ensures smoothness, and avoids the transmission of any vibration to the airframe. The Armstrong Whitworth cowling rings give effective cooling under all conditions with minimum drag.

Three-bladed De Havilland controllable pitch airscrews are fitted.



ACCOMMODATION

The control room for the captain and first officer in the extreme nose has side-by-side dual control with separate columns and hand-wheels, and parallel motion rudder bars. The captain is on the port and the first officer on the starboard side. A radio operator and two stewards complete the crew. Aft of the control room the fuselage is divided up into separate cabins. There are four in the European and three in the Empire class.

European Class

There is accommodation for 40 passengers.

Empire Class

There is accommodation for 27 passengers by day and 20 by night with sleeping accommodation.

In both classes there is a steward's pantry and in the European class there are three lavatories and in the Empire class two.

On the European services the passengers are carried as follows : 12 in the front compartment, 4 in the card room, 12 in the middle cabin and 12 in the rear cabin.

On the Empire services 20 sleepers are arranged as follows : 4 in the front cabin and 8 each in the middle and rear cabins.

Mails and luggage are stowed in the hold on the upper deck of the middle compartment.

DIMENSIONS

Span	123 ft.
Length	110 ft. 6 in.
Height over airscrew tips .	23 ft.

PERFORMANCE

Powered by four medium supercharger Armstrong Siddeley Tiger IX engines, developing 830 h.p. for take-off and a maximum of 810 h.p. at 6,500 ft. The designed top speed is better than 200 miles per hour and the range is 500 miles against a 40 miles per hour head wind. The cruising speed is 160 miles per hour. Provision has been made to carry extra fuel to give a range of 1,000 miles against a head wind. In still air the Ensign will have a normal range of 760 miles.

MILES MAGISTER

TYPE

Two-seat light training monoplane, made by Phillips and Powis Aircraft Ltd., Reading.

WINGS

Low-wing cantilever monoplane. Two built-up wooden box spars. Wooden girder type in extensions. Wooden box-ribs of ring type in centre-sections. Whole covered with plywood. Wooden ailerons. Vacuum-operated split trailing-edge flaps.

FUSELAGE

Box structure of plywood and spruce.

TAIL UNIT

Cantilever fin with wooden frame covered with fabric. Cantilever tail-plane with wooden frame covered with fabric. Unbalanced control surfaces of same construction.

UNDERCARRIAGE

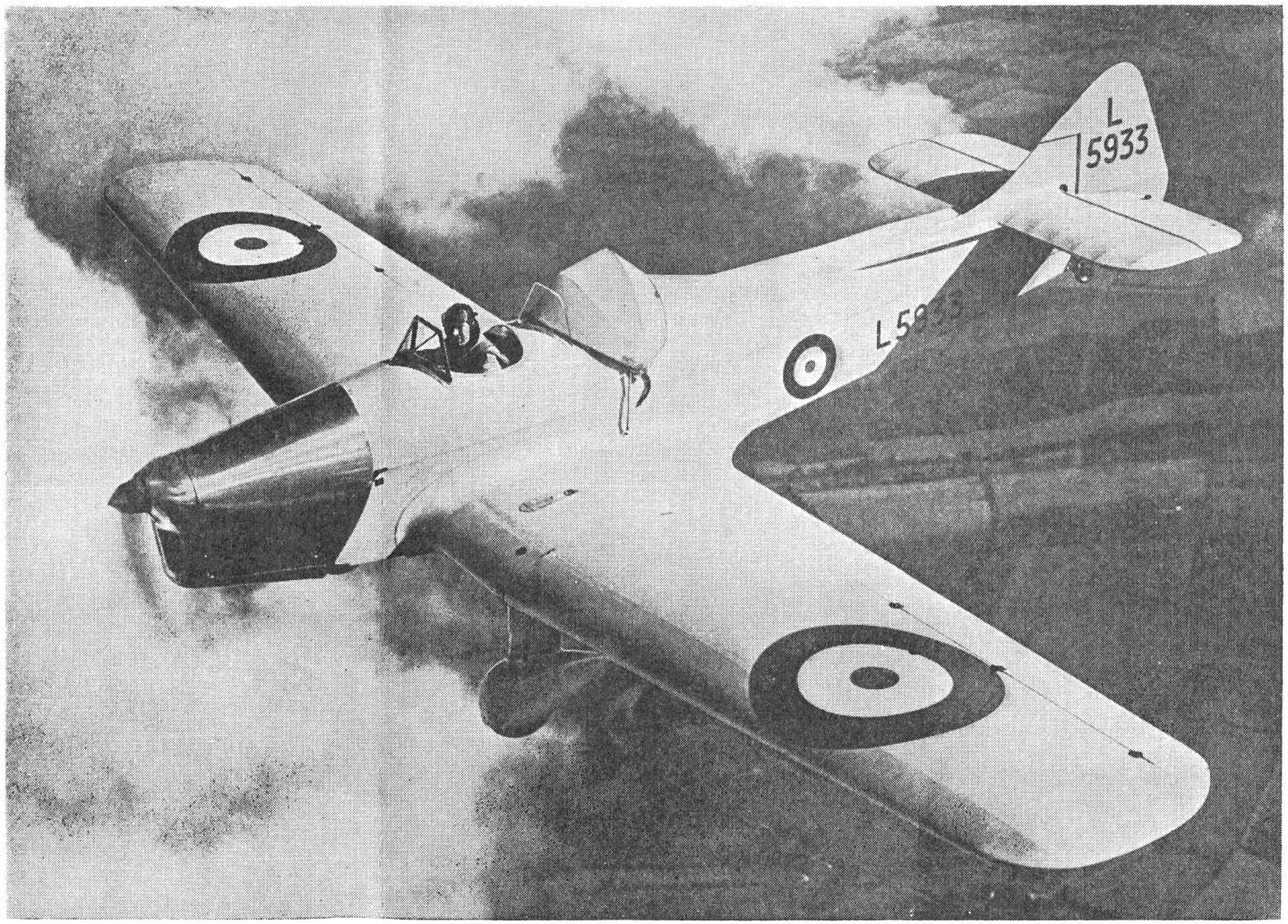
Divided type. Lockheed single-strut cantilever oleo airdraulic type. Dunlop low-pressure wheels and tyres. Bendix brakes with differential rudder bar control and separate hand lever. Detachable metal fairing. Tail wheel.

POWER PLANT

One 130 h.p. D.H. "Gipsy Major" four-cylinder inline inverted air-cooled engine on welded steel-tube mounting. Fuel tanks of 22 gals. total capacity in centre section. Oil tank mounted on engine bulkhead.

ACCOMMODATION

Two open cockpits in tandem, with dual control. A door to each. Parachute seats. Large locker behind rear cockpit.



DIMENSIONS

Span, 33 ft. 10 in. Length, 25 ft. 3 in. Height, 6 ft. 8 in. Wing area, 176 sq. ft.

WEIGHTS AND LOADINGS

Weight, empty, 1,240 lbs. Fuel and oil, 175 lbs. Maximum loaded weight (aerobatic), 1,825 lbs. (normal), 1,900 lbs.

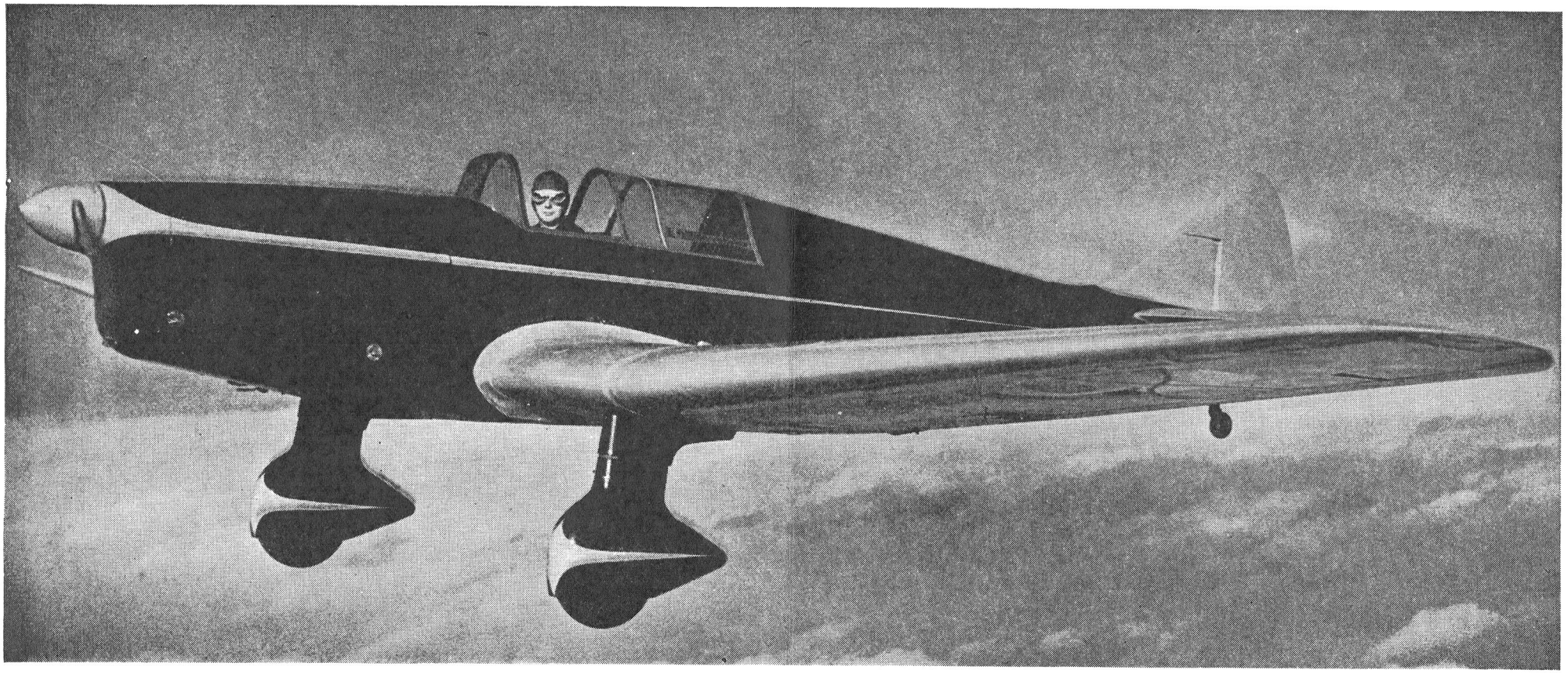
PERFORMANCE

(1,825 lbs.) Maximum speed, 145 m.p.h. Cruising speed, 125–150 m.p.h. Landing speed, 45 m.p.h. Take-off run, 70 yards. Landing run with flaps and brakes, 100 yards. Maximum ceiling, 18,000 ft. Rate of climb at sea level, 12,000 ft./min.

EQUIPMENT

Full set of standard instruments in both cockpits, including turn and bank indicators, fore and aft levels and compasses. Blind flying hood.

MILES MOHAWK



TYPE

A two-seater touring monoplane made by Phillips and Powis Aircraft Ltd., Reading.

WINGS

Conventional Miles type construction.

FUSELAGE

Stressed-skin construction developed from standard Miles type.

TAIL UNIT

Cantilever fin and tail-plane. Wooden construction and fabric covering throughout.

POWER PLANT

One 200/275 h.p. supercharged Menasco six-cylinder Buccaneer.

UNDERCARRIAGE

Single Lockheed shock absorber each side. Wheel brakes.

ACCOMMODATION

Two seats in tandem. Back seat adjustable. Coupé may be opened or closed over either section independently. Dual control, *i.e.*, throttle control column, rudder pedals.

DIMENSIONS

Span, 35 ft. ; length, 25 ft. 6 in. ; height, 6 ft. 6 in. ; span (wings folded), 16 ft. 6 in.

WEIGHTS

Tare, 1,606 lbs. ; pilot, 170 lbs. ; passenger, 170 lbs. ; fuel (96 gals.), 739 lbs. ; oil (4 gals.), 36 lbs. The maximum all-up weight with a normal category C. of A. is 2,700 lbs., when the aeroplane is being flown solo.

PERFORMANCE

Maximum speed at 4,500 ft., 190/195 m.p.h. Cruising speed at 4,500 ft., 170 m.p.h. Consumption at cruising revs., 10 gals./hr. approx. Landing speed, 44 m.p.h.

MILES PEREGRINE

TYPE

Six-passenger twin-engined cabin monoplane made by Phillips and Powis Aircraft Ltd., Reading.

WINGS

Low-wing cantilever monoplane. Same construction as for "Hawk Trainer." Miles split flaps electrically operated, but with alternative hand control. Trimming tab in the trailing-edge of one aileron, controlled from pilot's cabin, to adjust lateral control for varying loads, etc.

FUSELAGE

Semi-monocoque structure of wood with plywood covering. Cabin is unobstructed by shear members of bulkheads.

TAIL UNIT

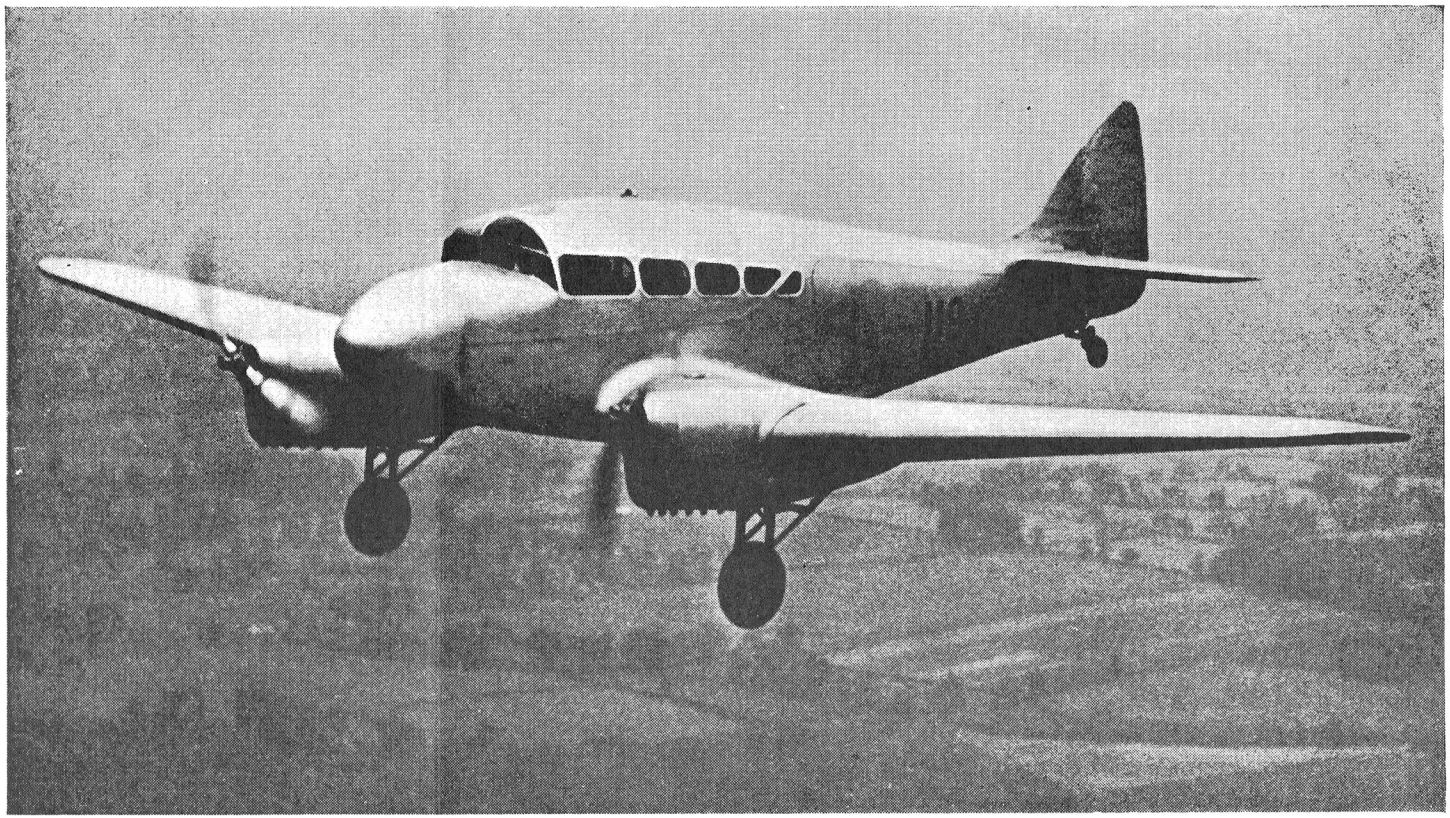
Monoplane type, wood framework, fabric covering. Trimming tabs in elevators and rudder controlled from pilot's cabin.

UNDERCARRIAGE

Retractable type. Each unit consists of a pair of long-stroke oleo legs, between which are carried the Dunlop wheel and two backwardly-inclined cranked legs which, when "broken," raise the wheel aft into the tail fairing of the engine nacelle. Dunlop pneumatic brakes. Compressed-air container is replenished by an electrically-driven automatically-controlled air pump. The stored air is also used to operate the split flaps. Tail wheel.

POWER PLANT

Two 200 h.p. D.H. Gipsy VI six-cylinder-in-line air-cooled inverted engines ; Series I or Series II with D.H. V.P. airscrews on welded steel-tube mountings attached to the spar extremities of the centre-section. Electric starters operated from cabin. Fuel and oil tanks in centre section outside fuselage.



ACCOMMODATION

Cabin (12 ft. long, 4 ft. 6 in. wide and 5 ft. high) accommodates two pilots in nose with dual controls and up to six passengers in pairs with central gangway between. Entrance door aft of cabin and luggage compartment with both inside and outside doors. Aeroplane bonded for wireless. Controls, wheels, rudder-bars and pilot's seat adjustable. All controls, including engine and flap controls, are duplicated. Equipment includes Harley retractable landing lights, navigation and interior lighting, etc.

DIMENSIONS

Span, 46 ft. Length, 32 ft. Height, 8 ft. 6 in. Wing area, 300 sq. ft.

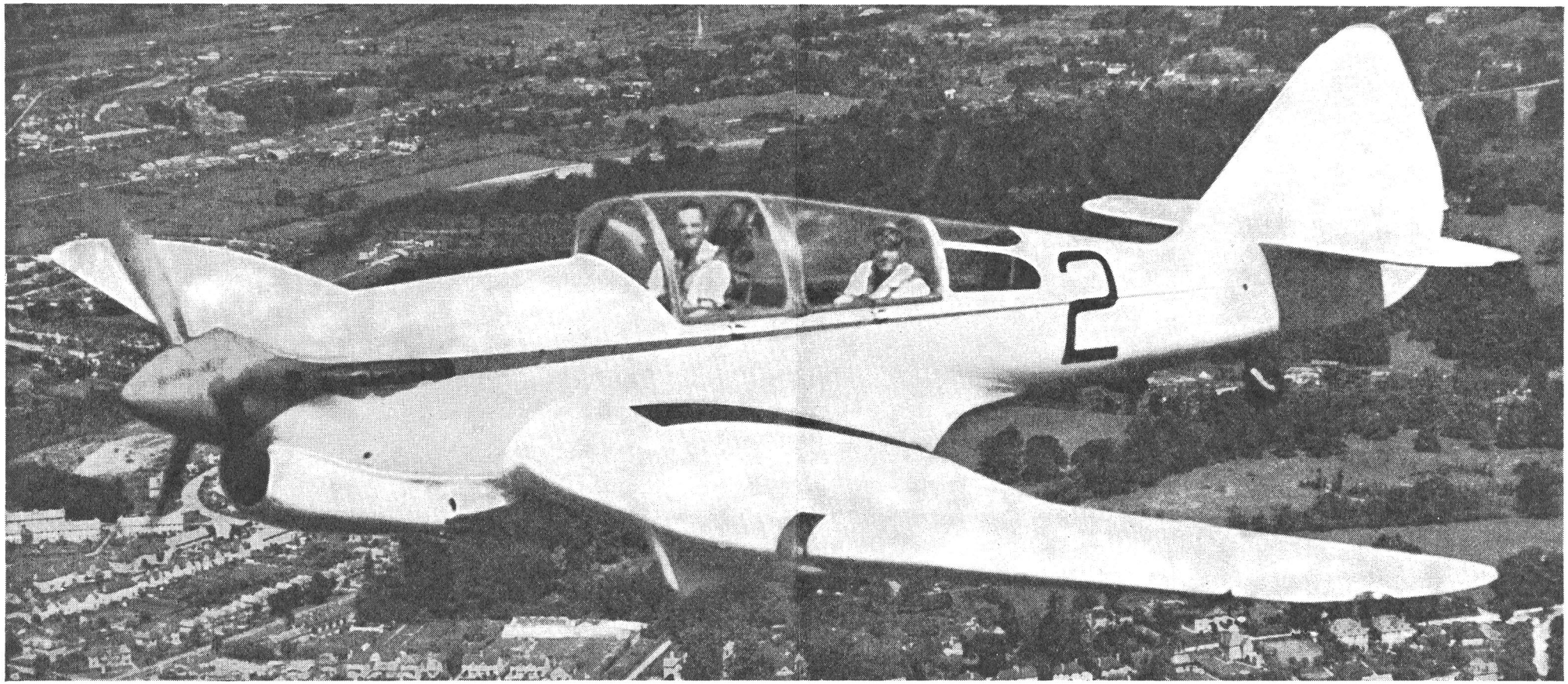
WEIGHTS

Weight empty, 3,200 lbs. Weight loaded, 5,700 lbs.

PERFORMANCE

Maximum speed, 180 m.p.h. Cruising speed, 160 m.p.h. Initial rate of climb, 900 ft./min. Absolute ceiling, 23,000 ft. Ceiling on one engine (fixed pitch airscrew), 3,000 ft. (5 mins.). Climb to 10,000 ft., 12½ mins. Climb to 16,000 ft., 21½ mins. Take-off run (5 m.p.h. wind), 220 yards. Landing run (5 m.p.h. wind), 200 yards. Cruising duration, 2¾ hours.

MILES R.R. TRAINER



TYPE

This aeroplane is a high-speed, low-wing monoplane of wooden construction made by Phillips and Powis Aircraft Ltd., Reading. It is powered with a Rolls-Royce Kestrel XVI engine, fitted with a three-bladed metal V.P. air-screw.

It has been constructed as a high-performance aeroplane for advanced training, reconnaissance and bombing, and may also be considered as a two-seater fighter, a multi-gun single-seater fighter or a general purpose aeroplane with a speed range of 5–1.

OVERALL DIMENSIONS

Length	30 ft.
Height	10 ft.
Span	39 ft.
Track	12 ft. 6 in.
Wing area	210 sq. ft.

PERFORMANCE

Approximate full throttle speed at different heights : Sea level, 230 m.p.h. At 5,000 ft., 250 m.p.h. At 10,000 ft., 270 m.p.h. At 16,000 ft., 295 m.p.h. Cruising at 2,600 r.p.m. (normal) at rated boost and 16,500 ft., 252 m.p.h. Cruising at 2,600 r.p.m. (normal) at rated boost and 10,000 ft., 254 m.p.h. Service ceiling, 30,000 ft.

AIRSPEED "OXFORD" (A.S.10)

TYPE

This aeroplane is a low-wing monoplane powered by two Armstrong Siddeley Cheetah X engines, each of 350 h.p., and has the Airspeed patent retractable undercarriage, which has been thoroughly proved during five years of continuous operation. Split trailing edge flaps, extending from aileron to aileron and right underneath the fuselage, are also fitted. In addition, provision can be made for fixed pitch, variable or constant speed airscrews as desired. Made by Airspeed Ltd., Portsmouth.

FUSELAGE

The rear section of the fuselage is of semi-monocoque wood construction. The fin is merged into the top surface of the fuselage by the use of wooden longitudinal stringers covered with fabric.

The rear fuselage has a high degree of torsional stiffness, which completely eliminates the possibility of tail flutter.

The front fuselage is built as a unit and comprises the cabin and the pilot's cockpit. This portion of the fuselage is also of semi-monocoque construction.

The cockpit side windows may be opened, and are large enough to be used as emergency exits.

A large door on the port side provides access to the cabin, and by means of quick-release hinges this door may be used as an additional emergency exit.

An emergency exit is also provided in the roof.

WING STRUCTURE

The wings are made in three sections, so that the outer extension planes can be quickly replaced in the event of damage. The extension planes are tapered, both in plan and front elevational views.

Special precautions have been taken to impart to the wing structure the greatest amount of torsional rigidity. This is achieved by using stressed skin ply-covered wings with wooden spars of orthodox box construction, having spruce flanges and three-ply webs.

The ribs are in three parts with braced webs and spruce booms.

The extension planes are quickly detachable from the centre section by removing two large bolts on each side and the control connections.

The centre section is built as a separate unit from the fuselage and is of similar construction to the extension planes.

The ailerons are slotted and mass-balanced, with the operating mechanism completely enclosed within the wings.

TAIL UNIT

Great care has been taken to make the tail unit particularly robust and stiff, together with an aerodynamically clean exterior. There are no external wires or struts, and the operating mechanisms for both the trimming tabs and the rudder are completely enclosed.

The tail plane unit is of full cantilever construction, with trimming tabs fitted to the trailing edges of the elevators. The elevators are joined at the centre, where provision for the operating levers and trimming tab control is made.

CONTROLS

An important feature on the Airspeed "Oxford" is the ease with which the inspection and maintenance of the control system can be carried out.

All cables leading from the controls are accessible for maintenance and adjustment.

Dual control is fitted and the directional control is by parallel motion rudder pedals.

FUEL TANKS

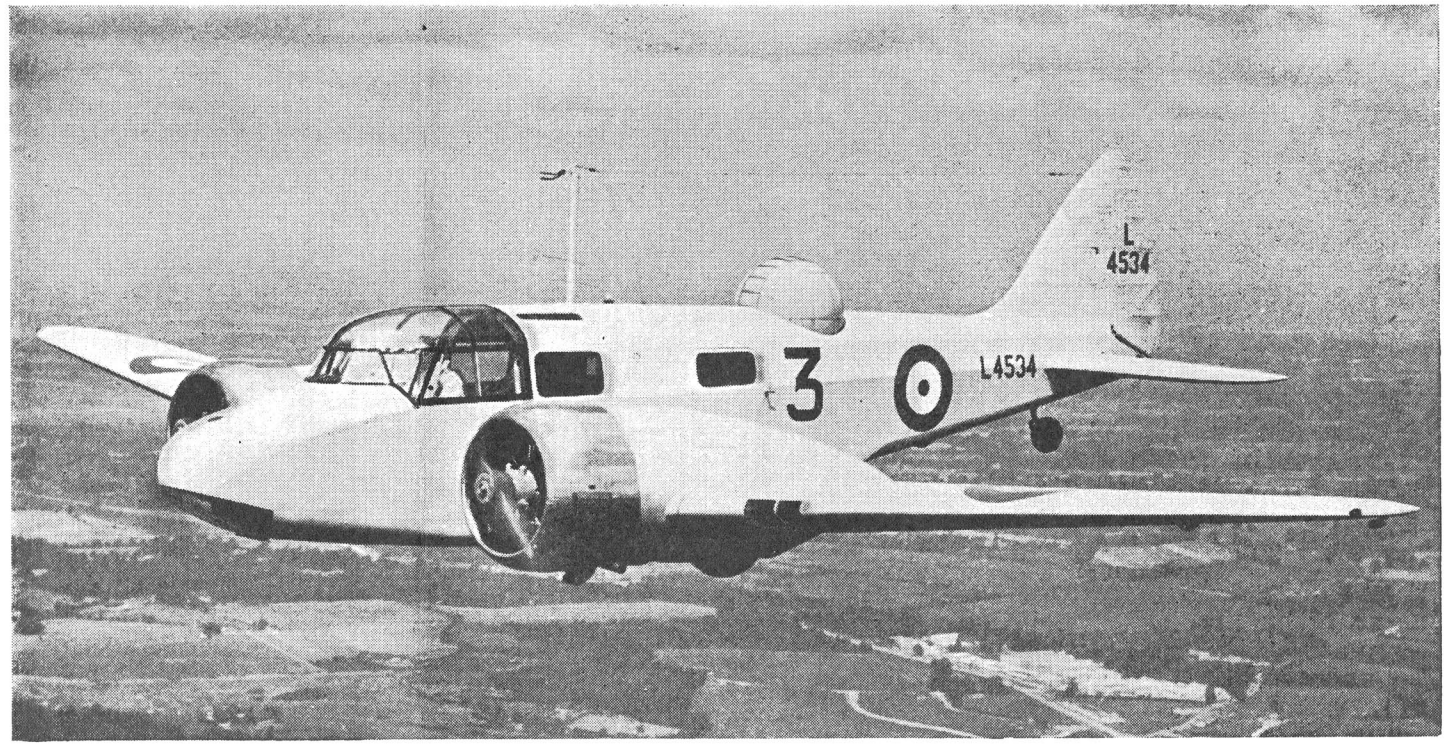
The main fuel tanks, each of 49 gallons capacity, are fitted in the centre section between the engine nacelles and the fuselage side, thus providing considerable freedom from fire risk.

Two additional tanks, each of 29 gallons capacity, are mounted in the extension planes and are interconnected with the main fuel tanks. Additional fuel capacity can be provided without difficulty to meet special requirements.

Jettison valves can be fitted to the main fuel tanks.

OIL TANKS AND COOLERS

The oil tanks are mounted behind the engine nacelles and are of a type combining oil tanks with coolers in one unit.



UNDERCARRIAGE

The shock absorber legs and the hydraulic retracting system are of special type developed by the Lockheed Company.

Each wheel is fitted with twin shock absorber legs, to which are attached jointed radius rods. One of these radius rods is fitted with an hydraulic ram, the action of which causes the radius rods to fold and draw the wheels into bays in the engine nacelles.

The wheels are of the Avery type and have balloon tyres, which give a liberal margin of robustness for the heaviest duties.

Dunlop brakes of the completely enclosed type are used, giving complete freedom from the sudden loss of brake efficiency on one side, due to water or oil on the brake drums.

ACCOMMODATION

Although the crew of the aeroplane would never exceed three at any time, stations are provided for six alternative positions. They are as follows :—

(1) Pilot.
(2) Navigator or second pilot.
(3) Bomb aimer.
(4) Wireless operator.
(5) Rear gunner.
(6) Photographer.

PERFORMANCE (Fitted with Armstrong Siddeley Cheetah X Engines and Fixed Pitch Wooden Airscrews)

7,300 lbs.

Maximum Speed.

Sea level	168 m.p.h.
5,000 ft.	179
7,500 ft.	185
10,000 ft.	183

PERFORMANCE—*Continued.*

Cruising Speed at 2,100 r.p.m.

5,000 ft.	163 m.p.h.
10,000 ft.	161 ,,

Range in Miles.

Cruising at 2,100 r.p.m. at 10,000 ft. 689 miles.

Endurance.

Cruising at 2,100 r.p.m. at 10,000 ft. { 4½ hrs. + ½ hr. full throttle.

Rate of Climb.

Sea level	1,225 ft./min.
6,000 ft.	1,175 ,,
10,000 ft.	890 ,,
15,000 ft.	550 ,,

Time to Height.

5,000 ft.	4¾ mins.
10,000 ft.	9½ ,,
15,000 ft.	16¾ ,,

PERFORMANCE—*Continued.*

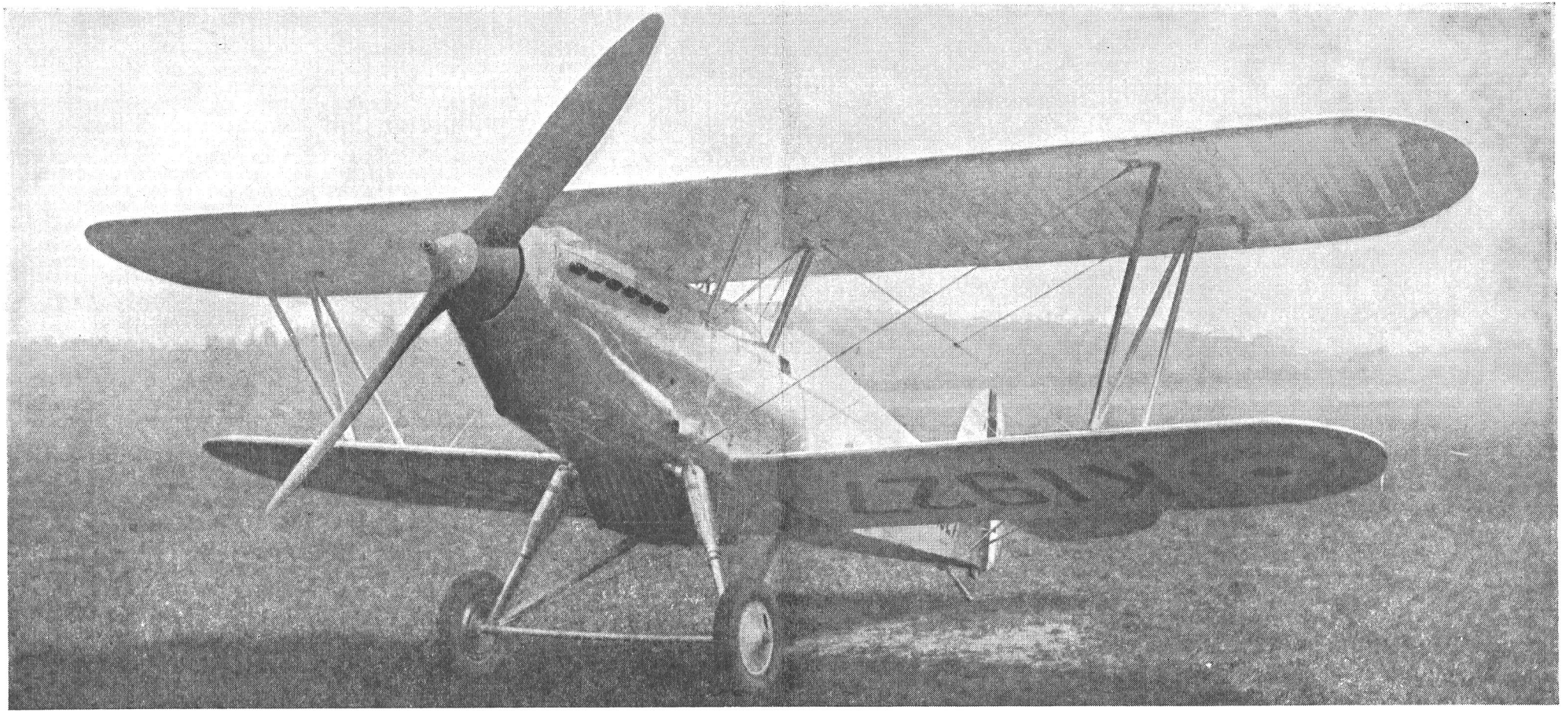
Service Ceiling	23,000 ft.
Single Engine Ceiling	6,000 ,,
Unstick Run (5 m.p.h. wind). Sea level	275 yds.

WEIGHTS (Fitted with Armstrong Siddeley Cheetah X Engines)

	Lbs.
Bare Weight + or – 3 per cent. (Fixed pitch wooden airscrews)	4,800
Fixed Military Load	430
Tare Weight	5,230
Fuel (150 galls.)	1,155
Oil (14 galls.)	126
Pilot + 1 Crew (with parachutes)	400
Removable Equipment	389
All-up Weight	7,300

V.P. Airscrews may be fitted, in which case the all-up weight may be increased by the corresponding amount without encroaching on military load or fuel.

HAWKER FURY



TYPE

A single-seater interceptor fighter, made by Hawker Aircraft Ltd., Kingston-on-Thames.

ENGINE

Rolls Royce " Kestrel " VI.

ARMAMENT

Two Vickers guns.

PERFORMANCE

Top speed, 223 m.p.h. at 16,400 ft. Climb to 19,680 ft. in 8·6 mins.

MAIN PLANES

	Top.	Bottom.	C/S.
Chord	5 ft. 0 in.	4 ft. 10 in.	5 ft. 0 in.
Incidence	3° 20′	3° 50′	—
Dihedral	1°	3° 30′	—
Span	30 ft. 0 in.	25 ft. 0¼ in.	5 ft. 6 in.
Area (sq. ft.)	98 (less aileron)	107·3	27·5

Gap at C/S	4 ft. 8 in.
Stagger at C/S	2 ft. 9⅜ in.

AILERON

Chord	1 ft. 2⅛ in.
Span	8 ft. 10½ in.
Area	19 sq. ft.
Range at T.E.	Down 23° / Up 26°

FIN

Area	5·25 sq. ft.

TAIL PLANE

Chord (less elevator)	2 ft. 3⅜ in.
Area (less elevator)	18·5 sq. ft.
Range of incidence	− 1° to + 6° 30′

RUDDER

Area	10·4 sq. ft.

ELEVATOR

Chord (maximum)	1 ft. 8½ in.
Area	13·5 sq. ft.

FUEL CAPACITY

Main tank	23 gals.
Gravity tank	27 „

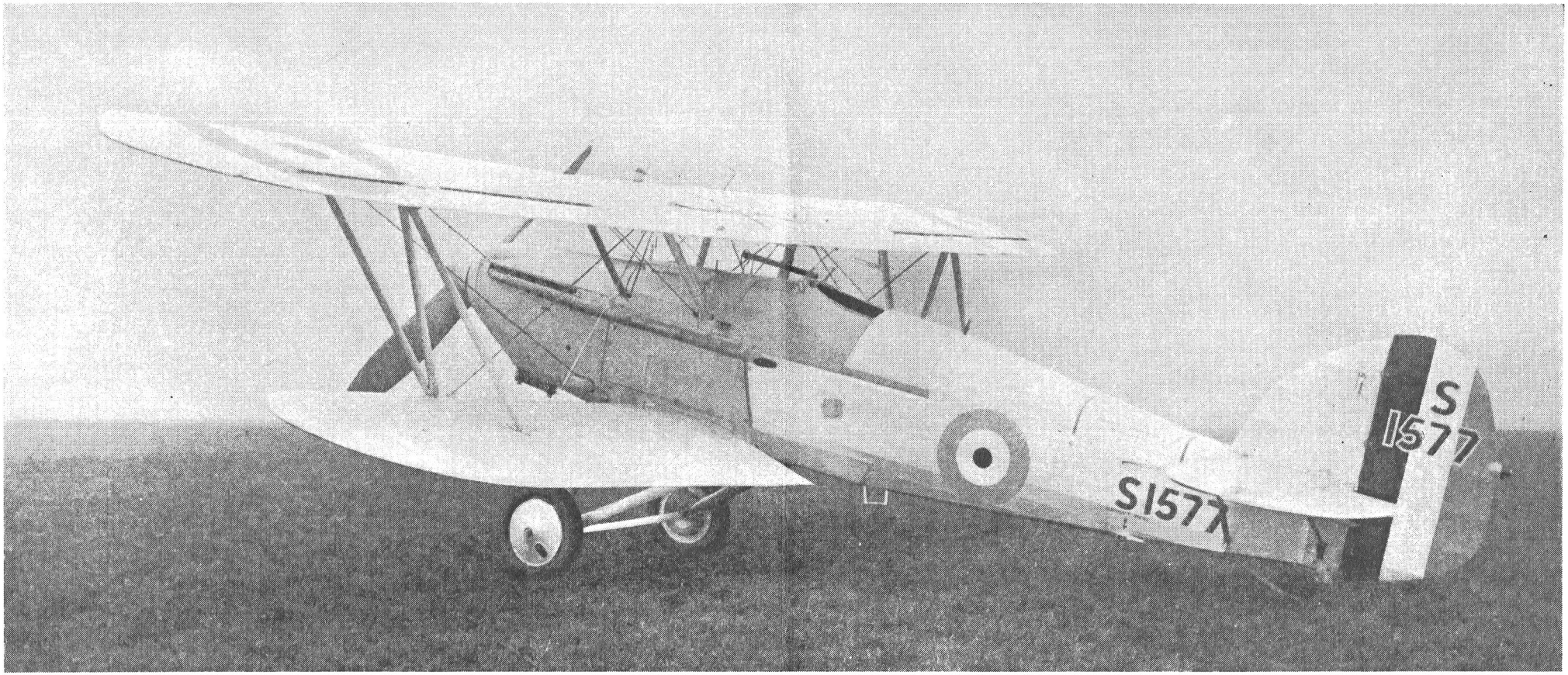
OIL CAPACITY

Normal	4¼ gals.

COOLING WATER CAPACITY (including Reserve Water)

Normal	13 gals.

HAWKER NIMROD



TYPE

Single-seater Fleet fighter, convertible to floatplane, made by Hawker Aircraft Ltd., Kingston-on-Thames.

ENGINE

Rolls-Royce " Kestrel " V.

ARMAMENT

Two Vickers guns. Light series bombs.

PERFORMANCE

Top speed, 181 m.p.h. at 13,120 ft. Climb to 16,400 ft. in 12·0 mins.

MAIN PLANES

	Top.	Bottom.	C/S.
Chord	5 ft. 3 in.	5 ft. 3 in.	5 ft. 3 in.
Incidence	3° 10′	3° 50′	—
Dihedral	1°	3° 30′	—
Span	33 ft. $6\frac{5}{16}$ in.	29 ft. 0 in.	6 ft. 0 in.
Area (sq. ft.)	169·5 (with aileron)	129	—
Gap at C/S			4 ft. $10\frac{1}{2}$ in.
Stagger at C/S			2 ft. 9 in.

AILERON

Chord	1 ft. $6\frac{7}{32}$ in.
Span	9 ft. $8\frac{5}{8}$ in.
Area	26 sq. ft.
Range at T.E.	23° up 24° down

FIN

Area . . . . . 5·25 sq. ft.

TAIL PLANE

Chord (less elevator)	2 ft. $3\frac{3}{8}$ in.
Area (less elevator)	22·55 sq. ft.
Range of incidence	− 1° to + 6° 30′

RUDDER

Area . . . . . 10·4 sq. ft.

ELEVATOR

Chord (maximum)	1 ft. $8\frac{1}{2}$ in.
Area	15·75 sq. ft.

FUEL CAPACITY

Main tank	46 gals.
Gravity tanks	16 „ each

OIL CAPACITY

Normal . . . . . $4\frac{1}{2}$ gals.

COOLING WATER CAPACITY (including Reserve Water)

Normal . . . . . $13\frac{1}{2}$ gals.

HAWKER HIND

TYPE
Two-seater high-performance light bomber, made by Hawker Aircraft Ltd., Kingston-on-Thames.

ENGINE
Rolls Royce " Kestrel " XVI.

ARMAMENT
One Vickers gun (pilot) ; one Lewis gun (observer). Bomb load, 535 lbs.

PERFORMANCE
Top speed, 205 m.p.h. at 14,500 ft. Climb to 19,680 ft. in 15·0 mins.

MAIN PLANES

	Top.	Bottom.	C/S.
Chord	6 ft. 0½ in.	5 ft. 0 in.	6 ft. 0½ in.
Incidence	3° 9′	3° 9′	—
Dihedral	1°	4°	—
Span	37 ft. 3 in.	31 ft. 4 in.	6 ft. 6 in.
Area (sq. ft.)	211 (with aileron)	137	—

Gap at C/S	5 ft. 5⅝ in.
Stagger at C/S	3 ft. 4½ in.

AILERON

Chord	1 ft. 9 11/32 in.
Span	10 ft. 11¾ in.
Area	35·54 sq. ft.
Range at T.E.	22° up / 18° down

FIN

Area	4·34 sq. ft.

TAIL PLANE

Chord (less elevator)	2 ft. 7⅛ in.
Area (less elevator)	24 sq. ft.
Range of incidence	− 2° to + 5°

RUDDER

Area	13·29 sq. ft.

ELEVATORS

Chord (maximum)	1 ft. 7⅝ in.
Area	17 sq. ft.

FUEL CAPACITY

Main tank	63 galls.
Gravity tanks	19 „ each

OIL CAPACITY

Normal	7 galls.

COOLING WATER CAPACITY (including Reserve Water)

Normal	12½ galls.

PERCIVAL "Q.6"

The Percival Q.6 is a high performance medium-powered, twin-engined aeroplane suitable for the private owner, airline feeder, special charter, aerial survey and photography work. It is made by Percival Aircraft Ltd., Luton.

WINGS

The wing is a complete cantilever, with torsionally rigid, new type wooden spar construction, wooden ribs, and reinforced leading edge.

The whole surface is fully protected against deterioration before finally covering, and is easy to maintain and repair.

Split trailing edge flaps are fitted, and operated by the Percival patented control from a simple switch in the cockpit. The wings are in three sections.

FUSELAGE

The fuselage is of plywood box construction, with fabric-covered fairing carried on stringers and formers.

The cabin is large and light, seating comfortably six or seven passengers, access being through a door in the side. At the aft end of the cabin, provision is made for carrying a large amount of luggage. The cabin sizes are :

Width	4 ft. 4 in. (1·32 m.)
Average height	5 ft. 2 in. (1·57 m.)
Length	9 ft. 2 in. (2·79 m.)

The luggage compartment is :
39 in. wide (1 m.) ;
25 in. deep (0·63 m.) ;
53 in. high (1·35 m.).

The pilot is situated forward, where his view is exceptionally good in all directions.

Dual control is fitted, and the second pilot's seat is on the starboard side of the first pilot.

TAIL SURFACES

The tail plane and fin are complete cantilevers. The elevators and rudder are fabric-covered wooden structures. Trimming is carried out by tabs on the elevators and rudder.

UNDERCARRIAGE

A robust long-travel unit is placed under each engine nacelle, and can either be fixed and faired in with streamline fairings, or arranged to fold back into the nacelle when the aeroplane is in the air.

POWER PLANT

Two Gipsy Six Series II engines of 205 h.p. each, with variable pitch airscrews.

The engines are fitted on the centre section, and underslung to give a clean top line to the wing.

The fuel tanks are housed in the wings, and the oil tanks are behind the engines.

ACCOMMODATION

Crew	One
Passengers	Six
Luggage	200 lb. (91 kg.)

Space for lavatory is available when not more than six persons are carried.

PERFORMANCE

Maximum speed at sea level	195 m.p.h. (313·7 km./hr.)
Cruising speed at 7,000 ft. (2,133 m.) (retractable undercarriage)	181 m.p.h. (291·2 km./hr.)
Cruising speed at 7,000 ft. (2,133 m.) (fixed undercarriage)	172 m.p.h. (276·7 km./hr.)
Landing speed (with flaps)	58 m.p.h. (93·3 km./hr.)
Take-off, fully loaded	200 yds. (182·8 m.)
Service ceiling	21,000 ft. (6,553 m.)
Ceiling on one engine	6,500 ft. (1,981 m.)
Rate of climb	1,150 ft./min. (350·5 m./min.)
Range at cruising speed	700 miles (1,126 km.)

WEIGHTS

Tare weight freighter	3,600 lb. (1,632 kg.)
Tare weight passenger	3,700 lb. (1,677 kg.)
Gross weight	5,500 lb. (2,494 kg.)

DIMENSIONS

Span	46 ft. 8 in. (14·22 m.)
Length	32 ft. 3 in. (9·83 m.)
Height	9 ft. 9 in. (2·97 m.)
Wing area	278 sq. ft. (25·8 m.²)

HAWKER HURRICANE

MAIN PLANES

Incidence	+ 2°
Dihedral	3½° on datum
Sweepback (on front spar)	3°
Area (with ailerons and flaps)	257·6 sq. ft. gross

MAIN PLANE AND C/S FLAPS

Range of movement	80° down from closed position
Area (total)	25·11 sq. ft.

AILERONS

Range of movement	22° up ; 21° down
Droop	Zero
Area	10·2 sq. ft. each

TAIL PLANE

Incidence	1½°
Area (less elevators)	19·8 sq. ft.

ELEVATOR

Range of movement	27° up ; 26° down
Area	13·46 sq. ft. each

ELEVATOR TRIMMING TABS (Two)

Range of movement	23° up ; 23° down
Area	0·38 sq. ft. each

FIN

Area	8·83 sq. ft.

RUDDER

Range of movement	28°, port and starboard
Area	13·06 sq. ft.

RUDDER FLAP

Area	0·36 sq. ft.

FUEL CAPACITY

Wing tanks (two)	69 galls.
Fuselage tank	28 galls.
Total capacity	97 galls.

OIL CAPACITY

Oil	7½ galls.
Air space	3 galls.

COOLING SYSTEM

Total capacity	15 galls.

DE HAVILLAND FLAMINGO

TYPE

The Flamingo medium-capacity passenger liner (D.H.95), a twin-engine aeroplane of metal construction, has an all-up weight a little more than half that of the Albatross. It is notable for its cabin roominess and for its high reserve of power. Capable of accommodating up to twenty passengers with a crew of three, toilet, luggage and mail compartments, it may be more generally described as a twelve- to seventeen-seater for operation on the longer stages of trunk routes.

DIMENSIONS

Length	51 ft. 10 in.
Span	70 ft.
Height overall	12 ft. $0\frac{3}{4}$ in.
Track	20 ft. 8 in.

ENGINES

Two Bristol Perseus XII c. of 890 b.h.p.

FUEL CONSUMPTION

69 galls./hr.

OIL CONSUMPTION

$2\frac{1}{2}$ galls./hr.

OIL PRESSURE

70–80 lb./in.^{2}

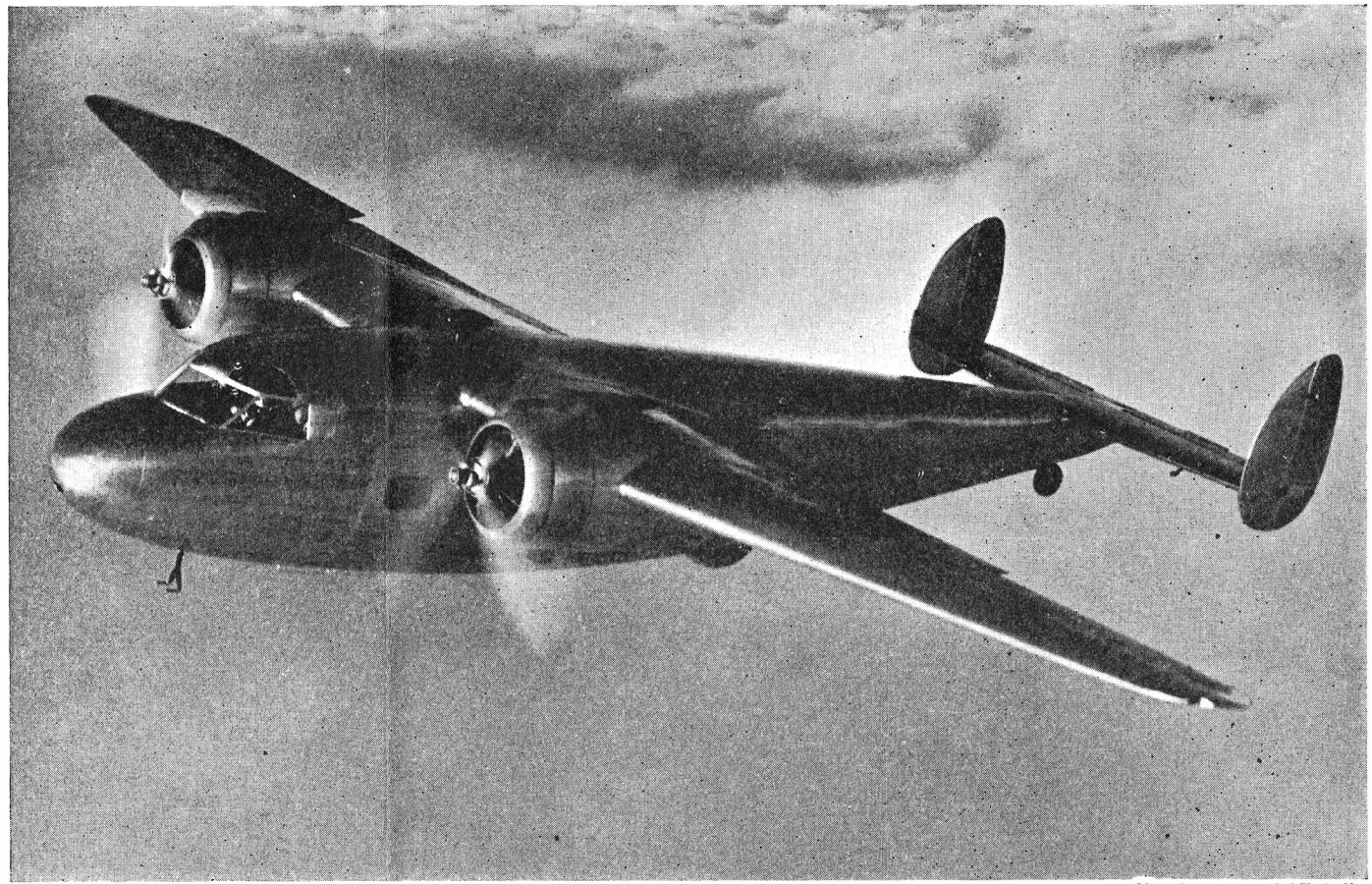


Photo by courtesy of "Flight."

WEIGHTS

Unladen	11,500 lb.
Crew of three	510 lb.
Fuel for 600 miles	1,485 lb.
Oil	189 lb.
Payload	3,316 lb.
All-up weight	17,000 lb.

PERFORMANCE

Maximum speed	234 m.p.h. at 7,000 ft.
Cruising speed	210 m.p.h. at 9,000 ft.
Range with fuel	1,250 miles with 410 galls.
Take-off run in 5 m.p.h. wind	280 yds.
Rate of climb at sea-level	1,630 ft./min. on take-off power
Service ceiling	19,400 ft.

The weight and performance data are based on the Perseus XII c. engine with non-feathering D.H. constant-speed airscrews. Standard Flamingo aeroplanes will be equipped with D.H. Hydromatic quick-feathering airscrews which will give improved weight and performance figures.

DE HAVILLAND MOTH MINOR

TYPE

The Moth Minor two-seater monoplane (D.H. 94) has been developed to provide a light aeroplane for training, private travel, and personal ownership which is of robust construction and superior performance, and which combines exemplary flying qualities, ease of piloting, and a new low level of first cost and running costs.

Simplicity is the basis of its design, whilst a useful disposable load and stowage place as well as a really safe and practical performance and range are outstanding features. The machine is stable in flight ; it may be flown with hands and feet off for an indefinite period. Wings fold for housing economy to a width of 12 feet. Wheel brakes and flap airbrake are fitted.

The standard Moth Minor open cockpit model is marketed at £575, while the coupé form sells at £690.

DIMENSIONS

Length	24 ft. 5 in.
Span	36 ft. 7 in.
Folded width	12 ft.
Height overall	5 ft. 10 in.
Track	6 ft.

ENGINE

90 h.p. Gipsy Minor.

FUEL CONSUMPTION

4–4½ galls./hr.

OIL CONSUMPTION

One pint per hour.

OIL PRESSURE

40–45 lb./in.²

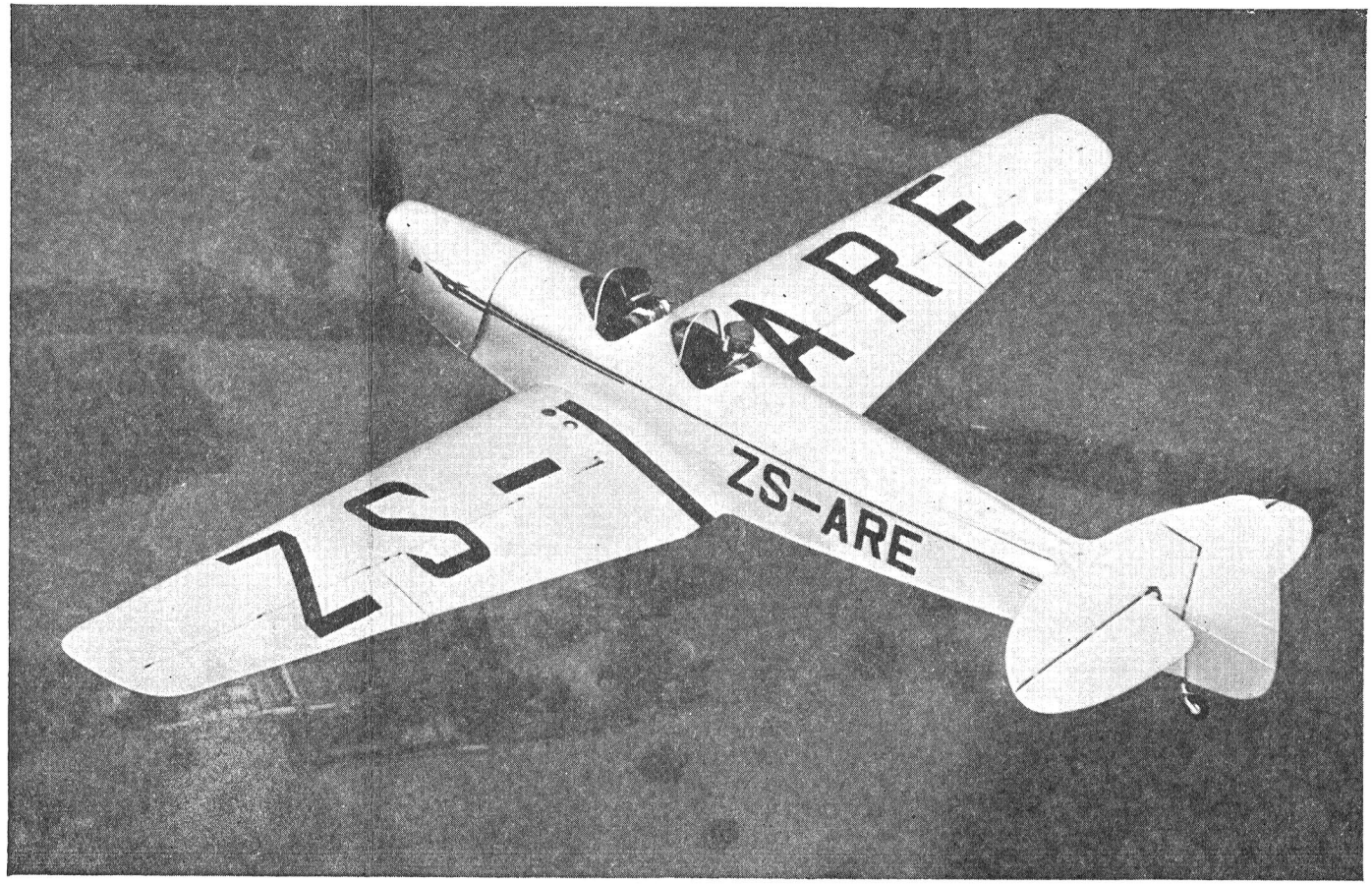


Photo by courtesy of "Flight."

WEIGHTS

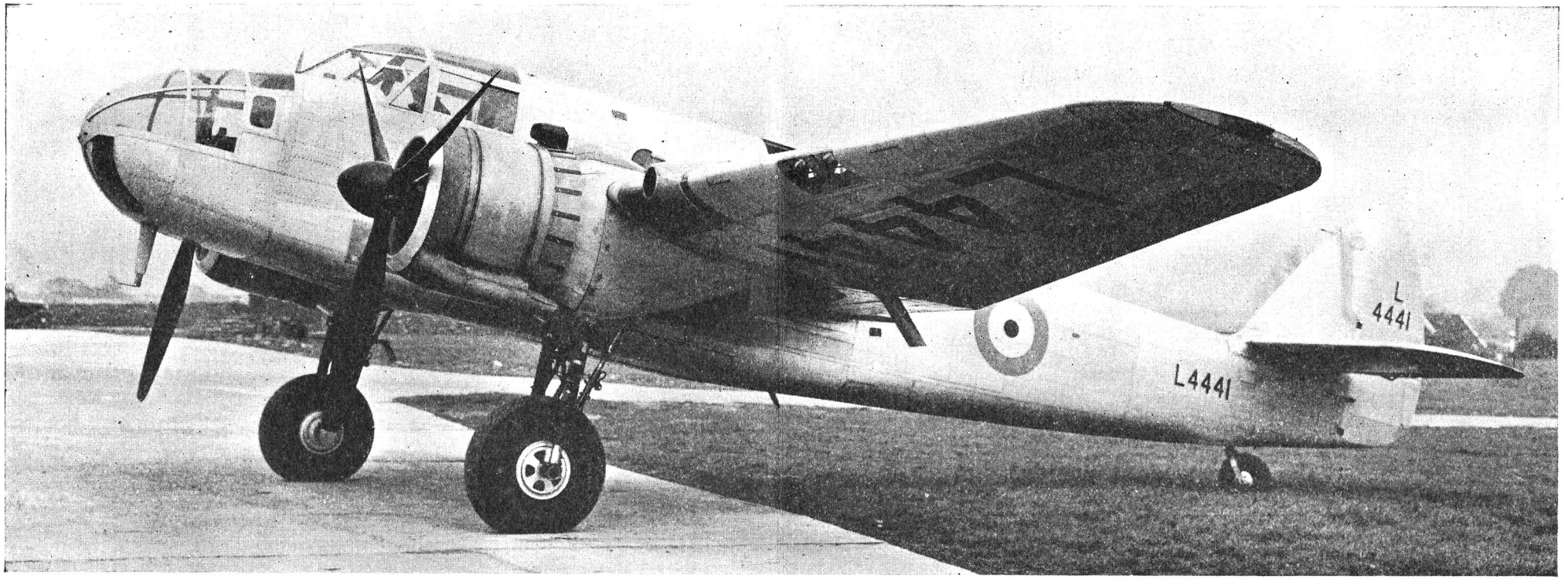
Unladen	989 lb.
Crew (2)	320 lb.
Fuel for 300 miles	98 lb.
Oil	14 lb.
Luggage	129 lb.
All-up weight	1,550 lb.

All-up weight for aerobatics, 1,450 lb.

PERFORMANCE

Maximum speed	118 m.p.h.
Cruising speed	100–105 m.p.h. at 1,000 ft.
Landing speed	43 m.p.h.
Range with fuel	300 miles with 13 galls.
Take-off run in 5 m.p.h. wind	190 yds.
Rate of climb at sea-level	620 ft./min.
Service ceiling	16,000 ft.

BRISTOL "BEAUFORT"



GENERAL CATEGORY AND TYPE

High-speed combined bomber, general reconnaissance, torpedo bomber and general purpose landplane.

TYPE OF ENGINES

Two "Bristol" Taurus sleeve-valve radial air-cooled.

ACCOMMODATION

Crew of four: pilot, navigator, gunner, wireless operator.

OVERALL DIMENSIONS

Span	57 ft. 10 in.
Length	44 ft. 2 in.
Height	14 ft. 3 in.

UNDERCARRIAGE

Retracting undercarriages and tail wheel.

AILERONS

Mass-balanced, hydraulically operated.

WINGS

Mid-wing all-metal stressed-skin cantilever monoplane.

GENERAL AIRCRAFT "CYGNET"

TYPE

The G.A.L. Cygnet is designed for training and touring duties. It is a single-engined, low-wing monoplane of all-metal construction, and carries two people seated side by side in a comfortably upholstered cabin. Tricycle chassis.

The idea underlying the design of the Cygnet has been to produce an aircraft of such aerodynamic qualities that it would be almost impossible for even the novice to get into any serious trouble ; and of such characteristics that no special skill is required for handling on to and off the ground, and a form of construction so robust that it can withstand long periods without maintenance.

POWER UNIT

The aircraft has been designed to be fitted with the Gipsy Major, Cirrus Major, or Menasco C.4S engines.

STRUCTURE

The aircraft is of all-metal construction throughout and properly protected to resist corrosion. The whole theme of construction is to provide a solid structure with the loads well distributed so that there need never be any fear of unseen concentrations leading to fracture.

At only a few points on the machine is the load concentrated into a definite path, as at the main wing joints, engine mounting joints, and control hinges, and here ample reserve of strength has been provided.

In the main structure there is an entire absence of filigree work, all spar webs are solid, all ribs are solid pressings, all spar flanges are solid extrusions and the skin is sheet metal. The pilot can, therefore, have complete confidence in the structural soundness of his aircraft, knowing that it does not consist of highly stressed links, but that all stresses are widely spread and the structure can withstand if necessary a lot of local damage without fear of collapse. It can also stand weathering without damage, such as exposure to tropical hail storms, dust storms, etc., which should give it a wide appeal in colonial markets where housing is scarce.

The undercarriage consists of three oleo-pneumatic shock absorbers anchored by cantilever attachments. Dunlop wheels and Bendix brakes are fitted. The front wheel is steerable off the rudder bar and provides complete control of the aircraft when motoring about the aerodrome.

ACCOMMODATION

Side-by-side seating is provided for two people in upholstered seats with ample accommodation for luggage at the rear of the cabin. The cockpit is covered by divided sliding hoods so that one or both sides can be opened in flight and be locked in any intermediate position.

STANDARD GENERAL EQUIPMENT

Full dual control.
Wheel brakes (Bendix-cable operated).
Vacuum-operated flaps (with position indicator).
Cabin ventilation and heating.
Fire extinguisher (Essex type with spray leads to carburettor).
Tool kit.

STANDARD INSTRUMENT EQUIPMENT

Airspeed Indicator.	Navigational.
Altimeter.	
Ball-type compass (with verge ring).	
Fore-and-aft level.	
Turn-and-bank indicator (Smith type).	
Clock (8-day).	
Oil-pressure gauge.	Engine.
Revolution indicator.	
Two hydrostatic fuel contents gauges (continuous reading).	

Night flying, engine starting and Sperry equipment can also be supplied.

DIMENSIONS

Span	34 ft. 6 in. (10·5 m.)
Length	23 ft. 3 in. (7·09 m.)
Height	7 ft. (2·13 m.)
Wing area	179 sq. ft. (16·65 sq. m.)

SUMMARY OF WEIGHT AND LOADING

Normal Category (weight)	Cirrus Major Engine	Gipsy Major Engine
Tare weight fully equipped	1,475 lb.	1,455 lb.
Pilot and passenger	340 ,,	340 ,,
Petrol (27 galls.), oil (3 galls.)	230 lb.	230 lb.
Baggage	155 ,,	75 ,,
Weight fully loaded	2,200 ,,	2,100 ,,
Aerobatic category		
Maximum all-up weight	1,950 lb.	1,950 lb.
Normal category (loading)		
Wing loading	12·3 lb./sq. ft.	11·7 lb./sq. ft.
Power loading	14·6 lb./h.p.	16·1 lb./h.p.
Performance (fully loaded) Normal category		
Maximum speed	135 m.p.h. at S.L.	130 m.p.h. at S.L.
Cruising speed (70% power)	115 ,, ,, ,,	110 ,, ,, ,,
Range	445 miles.	460 miles.
Landing range *	60/85 m.p.h.	60/85 m.p.h.
Initial rate of climb	800 ft./min.	700 ft./min.
Service ceiling	14,000 ft.	14,000 ft.

* *Special Note :* The Cygnet remains horizontal and under full control down to a speed of 45 m.p.h., although the aircraft is, of course, sinking at this speed.